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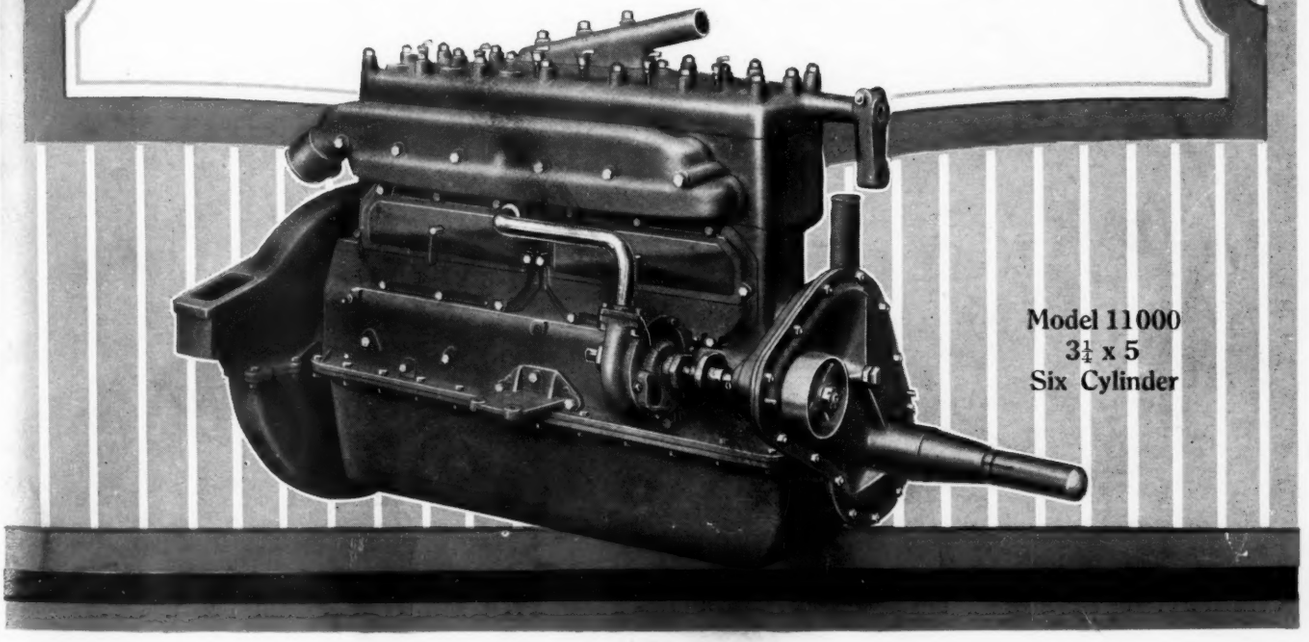

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AUTOMOTIVE INDUSTRIES
The AUTOMOBILE

VOL. XLII NEW YORK—THURSDAY, MAY 13, 1920 No. 20

Present Credit Tendencies and Their Causes

Business men have been aware for some weeks that the long awaited period of readjustment is at hand. In fact, it has been quite generally in force and is gaining in momentum. The bankers who are chiefly responsible for this movement are confident that if manufacturers and merchants will move cautiously there will be no serious damage.

NEW YORK, May 10.

BANK credits have become the two most important words in the vocabulary of every business man in the United States. Upon them hang his own business future and the future of every person he employs. They are nowhere more important than in the automotive industry. For the man or the company whose house is in order they do not conjure up a picture of impending calamity. There always will be credit for sound business principles.

The period of readjustment from war to peace conditions, which everyone has realized must come sooner or later, has arrived. In fact, it has been here almost since the beginning of the year. The signs at first were almost imperceptible and only those institutions whose interests were far flung were able to sense them. They now have percolated down through the entire business structure. Inflation and expansion could not go on unchecked, even though there still is tremendous under-production. There must be an end to the "vicious circle" of wage increases followed by equal or greater increases in the price of every commodity involved. The country must get back on a sane and permanent basis. The great question is whether the return to that basis shall be by easy stages which will not throw industry and commerce out of joint or whether it shall be with a jolt which will shake the whole financial structure of the nation.

There is no reason why it cannot be accomplished gradually. That is what the Federal Reserve Board and its large member banks are trying to bring about. They cannot do it alone and there must be co-operation from every quarter. Capital alone cannot bear all the burden. It must rest equally upon labor. There is no disposition in any reasonable quarter to ask for a reduction in wages until the cost of living goes down, at any rate, but there will be serious opposition to further increases. Industry would not object particularly to high wages if the workers gave value received and put their utmost energy and efficiency into their work. It is not to be denied, however, that, with high wages and shorter hours, there has been a falling off in production which has added materially to the costs of manufacture and thereby to the cost of living.

The big New York banks are optimistic. They do not believe there will be a panic, even in Wall Street,

now or later. They do not believe there will be a sudden crisis. Weeks ago they looked for one every day, but the country has ridden through the storm and the banks have come to realize that there is not likely to be any sudden jolt if the country's business engineers keep their heads, with a sharp lookout before them so they can sidestep danger signals. The last thing the banks want is hysteria. They declare, on the contrary, that common sense and steady nerves never were so necessary as they are now.

Bankers are cautious individuals and they never tell all they know, even to their best customers. To many persons it has seemed there was mystery in their moves, but analysis of the situation dispels the clouds. The initiative was taken by the Federal Reserve Board months ago when it called for deflation and liquidation. It insisted that loans for speculative purposes must be curbed. To bring this about it raised its rediscount rates. The results were not all that were hoped for. Some goods came out of the warehouses where they had been hoarded to await higher prices, but not enough to bring about any appreciable reduction in the cost of living. The money to finance speculative transactions was forthcoming from some source or other.

It was apparent that more rigorous methods were required. It became necessary to impress upon the mind of every man who went to the bank for credit that he must help bring about the readjustment. Getting a loan ceased to be a matter of routine. Instead of sending the treasurer down to see the banker, the president of the big company had to go himself, just as the smaller business man has always had to do. It made no difference whether the sum asked was $1,000 or $1,000,000, the procedure was the same.

The banker became a human interrogation point. He insisted upon being shown. He wanted to know why and what for. If he considered the loan wise from the broad viewpoint of community or national necessity, he made it. Otherwise he didn't.

If the leading banks of New York are to be believed, and there is no reason to doubt their word, it is virtually impossible to-day to get a loan for speculative purposes, even in Wall Street. Call money rates are high and will continue high. The banks will supply funds to stabilize the market, but they will not permit any far flung bull operations.

If a man wants to borrow money to finance a big purchase of silk stockings on the theory that the prices will go higher later on, he won't get the money. If he wants to get the money to finance a big purchase of potatoes, he can get it if he is able to show the banker that the potatoes are going to the ultimate consumer at the earliest possible moment. He can't get it if he intends to put them in a warehouse and hold them for higher prices.

The banks are scrutinizing closely every bit of commercial paper presented to them for discount. They don't want any more business than they have. The great New York institutions, which are the financial bulwarks of the country, called in their road men weeks ago. They are refusing to accept new accounts unless the would-be patron can give a good reason for getting his money into their vaults. The big banks believe the general policies formulated by the Federal Reserve Board are sound and they are upholding them loyally. There is a disposition to grumble a bit, however, on the ground that that board is inclined to be a little too paternal. Some of them think the individual banks should be permitted to determine for themselves what classes of paper they shall discount and what classes they shall not. Some of them think the Federal Reserve Board is doing a little "too much talking."

Some branches of the automotive industry are feeling the credit pinch a little more than other lines of business. There is a disposition on the part of bankers, not only in the Kansas City district but in other sections, to class many sales of passenger cars as non-essential. There is no inclination, however, to shut down on credit for trucks, tractors or agricultural implements.

The situation can be summed up in the statement that there is not money enough to go around unless expansion is curbed. The chief trouble is that there is a little too much enthusiasm on the part of manufacturers and consumers. Factories, as they stand, cannot keep pace with orders and their owners quite naturally are eager to increase their capacity to get the business while it is going. These factory expansions have consumed an enormous amount of money without any concomitant returns in production on account of the scarcity of raw materials and labor. This condition probably has prevailed in the automotive industry to a greater extent than any other.

RIGID conservation of industrial resources was asked by the Federal Reserve Bank of New York in the following statement issued on May 7:

"Clearly the present is not an appropriate time to extend business merely for the sake of increased volume or profits. Nor is it a time for public or private improvements not absolutely necessary for health and efficiency.

"With a shortage of goods and labor, the necessity of conserving both is as great as it was during the war, and requires an even higher degree of self-restraint on the part of bankers, producers, distributers and consumers, since governmental controls no longer exist."

Not only are established companies, which are on a solid foundation and which can weather almost any sort of storm, enlarging their production facilities, but there has been a veritable flood of new enterprises. In April alone 1262 companies, each with an authorized capital stock of $100,000 or more, were incorporated in the principal states. The total represented $1,354,262,400. This compares with a total of $515,665,300 for 700 companies in the same period a year ago. The total since Jan. 1 has involved the stupendous sum of $6,169,381,000, an increase of 262 per cent over the figures of 1919. Seemingly the high credit tension as reflected in high interest rates has failed to exert a restraining influence on new flotations.

Banks are frowning on new enterprises and on factory expansions unless it can be demonstrated that there will be a steady future demand for the commodity in which production will be increased. In this respect, they insist the product must be an essential. Each bank, largely influenced by the ideas of the Federal Reserve Board, determines for itself what is essential. There is no hard and fast rule but anything which can be legitimately classed as a luxury comes under the ban and some things, such as passenger automobiles, suffer with the guilty.

The man who has any part in the production of luxuries will have a hard road to hoe for the next few months at least. The bottom has fallen out of the raw silk market. This was the factor which had most to do with the financial crash in Japan and resulted in the closing of the stock exchange by the government. Amer-

(*Continued on page* 1129)

Economic Difficulties Retard Car Output in France

With a potential capacity of 200,000 a year and buyers' demands far exceeding the supply, the French factories will build no more than 50,000 automobiles this year. The causes for this shortened production, told here by Mr. Bradley, should be read by every American maker, particularly in view of present and future industrial conditions in this country.

By W. F. Bradley*

PARIS, April 20.

SWITCHING the big French automobile factories from a war basis to peace production has been a much more difficult task than the heads of these organizations anticipated and the operation has been longer than the public had been led to expect. The war period was far from being the more difficult and the building up of the big factories, while the enemy was practically at the gates of Paris, was child's play in comparison with the task which has faced manufacturers since the armistice.

One of the most prominent French makers declared recently in a private conversation: "During the war bread and butter were dropped into our mouths; now we must work hard for them."

Quite a false impression was created by the last Paris Salon. Such a wealth of new material was displayed that the public was led to believe that production would follow immediately and at a rapid rate. This was a mistake, for while clever French engineers created beautiful designs in a few weeks, long months have been necessary to put those designs into production.

The French Output

Few French makers have been able to live up to the program laid out at the armistice. This year it is certain that the output of the French factories will not exceed 50,000 cars, compared with the estimated possibility of these factories of 200,000 cars per year.

While general conditions are the same for all, progress is not by any means uniform. The strenuous post-war period with all its unexpected difficulties has served to show in which factories there is really vigorous management and intelligent control. The names could be given of a score of factories which have not at the present moment—eighteen months after the armistice—delivered a single car to the public and will not be ready for several months to make any deliveries. On the other hand, a few makers are in quantity production and are on the eve of a big increase in output.

Citroen has not the biggest factory in France, for he does not employ more than 6000 workers, but he leads the French market with an output of 60 cars daily and before the end of the year will have exceeded his original program of 100 cars per day. Delage is also well up on his program, with an output of 60 to 75 cars monthly. These are high-class cars, which obviously cannot be produced in such quantities as the cheap Citroen. The Darracq factory is in full production with 10 cars each day and has an organization which will permit of a rapid increase. Berliet is building 30 trucks daily, but he has not been able to get his new passenger car on the market. Ariès is producing 10 trucks a day, but will have no touring cars ready before the middle of the summer.

Production Lags

Lorraine-Dietrich and Clement-Bayard will not be in production until the middle of the summer. Sizaire-Berwick will produce within two months. Renault, Panhard, Peugeot and De Dion-Bouton are still far from being up to their full capacity. Among the newcomers Voisin is well up in production, although the output there always will be small. Farman, on the other hand, has not started deliveries. Hispano-Suiza, which financially is one of the most powerful firms in France, has gotten out only a first small series of experimental models and will not make deliveries until the middle of the year.

The Saurer factory, which during the war had to be switched from truck construction to the production of the Renault 300-hp. aviation engines, is now back on trucks exclusively and last July took over the Hotchkiss factory erected at Lyons during the war. This will be used for building a light truck, while the original factory near Paris will be kept on the heavy type of truck.

Brasier has specialized on a touring car of 18 hp. and has taken up the construction of a 5-ton truck, both of which will be built near Paris. Production is not yet normal, for a lot of time seems to have been lost in converting the shops from a war to a peace basis. In addition to these lines, the Brasier company has formed an auxiliary company which has acquired the rights for the Pavesi agricultural tractor, designed by the Pavesi company of Milan, Italy. This tractor will be built in a new factory at Grenoble, at the foot of the Alps, where elec-

Mr. Bradley is the European correspondent of AUTOMOTIVE INDUSTRIES.

tric furnaces, with current obtained from water power, are available.

The Salmson company, which was one of the largest producers of aviation engines during the war, is not making more than 10 per cent of its capacity. A contract is in hand for 2000 G.N. cyclecars, an English design, for Gaston, Williams & Wigmore; a body department is working for Turcat-Mery and for Picard-Pictet, and about 900 magnetos per month are being produced.

The Blériot aviation factory is tooled up for motorcycle production. Although no machines have been delivered, the stock rooms are well filled and production should come rapidly. Other portions of the factory are being used to build motor fishing boats and furniture.

Build Many Models

Despite the lessons of the war, French firms as a whole have not realized the necessity of concentrating on a single model. Yet the fact is already obvious that the firms making good are those which limited themselves to one type of car. Citroen, Delage, and Darracq, with one type each, are making deliveries. Renault, Panhard, De Dion-Bouton, and Peugeot are each building almost as many types of cars and trucks to which they have added agricultural tractors and lighting sets, as before the war.

There is still a fear among certain sections of the automobile industry that the point of saturation soon will be reached after all the war-enlarged factories get to work. This fear is not shared by the enterprising members of the industry.

André Citroen declares: "France has immediate need of 500,000 automobiles. This year our home factories cannot exceed 50,000 cars, many of which will be exported. In 1921 and 1922 we shall be unable to meet even the immediate requirements, and it must not be forgotten that the use of automobiles is growing rapidly in France and elsewhere. Before the end of this year, I shall have accomplished my task of building 100 cars a day—an output which has never yet been attained in a European automobile factory. But I do not intend to stop there, but to go on increasing until I have attained an output of 1000 per day."

Louis Delage, although interested in the production of an entirely different type of car, is equally convinced that the point of saturation is not even in view. He pointed out that it has not been attained in America and that there is a long way to go before the same stage of material comfort is secured by the nations of Europe as in the United States. Delage is of the opinion that the present high cost of living will inevitably decrease but wages will not go down, with the result that the masses will be in a position to secure commodities, including automobiles, that formerly were not within their reach.

Causes for the Delay

The reasons for the delay in getting into production with all the rapidity expected more than a year ago, are many and varied and are not all to be found in the automobile factories themselves. France has been shaken to the roots of her existence, her life has been threatened, her richest industrial regions have been invaded and, no matter how powerful her automobile factories or how skilled and vigorous the individual managers, there are general conditions before which they are powerless.

In conversation with members of the industry, it was felt that in the recesses of the minds of most of them was a lurking fear of the future. They were careful to avoid expressing it but, nevertheless, it could be felt that there was anxiety and fear as to what the great social movement of the future would bring forth. One leader of the industry, bolder than the others, said:

"Why should we hide the fact that we are afraid of a social revolution? This is not an admission of cowardice, for it is not for ourselves that we are afraid, but for the interests we represent. The existent fear, indeed, may bring about a revolution, for it is having a paralyzing effect on leaders throughout all industry and if carried too far will result in unemployment.

"At the present time the great mass of workers is satisfied, for there is plenty of work and wages have kept pace with the increased cost of living. But if labor cannot find employment, owing to the timidity of capital, the revolutionary party will have the opportunity for which it is waiting. Personally I could increase my capacity 100 per cent if I wanted to appeal to outside capital. But I hesitate to do so, because of the uncertainty of the future.

"If a social upheaval arrives, as is quite possible, changes will take place, the storm will pass, but it will not wipe out any of the obligation I have contracted. Hundreds must have the same fear as myself and, because of our fear of labor, and because of labor's distrust of capital, we are drifting toward a condition detrimental to all."

Inadequate transportation is quoted by the majority of French leaders as being responsible for the troubles of the French industry. "Ninety per cent of our troubles are directly traceable to poor transportation," declares André Citroen. "The eight-hour day has held us back somewhat, but it is a minor matter compared with transportation. It would not help us much if the automobile factories went back to the sixty-hour week so long as transportation is inadequate and the supply of raw material so unsatisfactory."

Transportation Needs

Owen Clegg, of the Darracq company, puts transportation first and foremost. Owing to poor transportation, anything available has to be used. Poor coal must be expected, iron ore of inferior quality has to be used. Castings before the war were always reliable but now, with poor sand, poor ore and indifferent coal, there is no uniformity. Even special alloy steels are variable in quality and frequently have to be scrapped.

Charles Faroux says: "Industrially our greatest requirement is transportation. For six months the whole of France ought to do nothing but build locomotives, freight cars and rails. For six months everything else ought to be of secondary consideration. On Aug. 2, 1914, the whole of France gave itself up to war. At present, there is only one object and all France ought to devote itself to it. When the transportation problem has been solved, everything will become normal. Coal, raw materials, foreign wheat, American meat, everything will come in. A balance will be established; we shall be able to produce and to export."

The price of automobiles is rising steadily. The Citroen, which started out at 9,000 francs ($1,800), is now at 18,000 francs ($3,600) and is expected to take another upward jump very shortly. The Delage six-cylinder chassis is selling at $14,000 instead of $9,000. Many makers do not guarantee that the prices quoted will be maintained when delivery is made. Darracq, for instance, only quotes price when announcing delivery and gives the purchaser the option of declining the car.

These increases have caused trouble between the factories and purchasers, and legal action has been taken, in several cases, to get delivery at the original price. Some courts have given a decision in favor of the manufacturer and others in favor of the client. One fact remains, however, despite the constantly rising prices, that orders are maintained.

Manufacturers point out that they are powerless before the increasing rates for all supplies. The Darracq company gives the following comparative list of prices. In certain cases, the parts mentioned are manufactured in the factory and the average price on the open market, therefore, is quoted.

	1914	1918	1920
Ordinary bar steel, per ton	$56.00	$180.00	$340.00
Special chrome-nickel steels, per ton	320.00	640.00	750.00
Ordinary bronze castings, per ton	520.00	1,200.00	1,800.00
Phosphor-bronze castings, per ton	640.00	1,300.00	1,940.00
Aluminum castings, per ton	650.00	1,300.00	2,700.00
Cylinder castings, per ton	140.00	520.00	1,000.00
Forgings (average prices) per ton	200.00	600.00	1,000.00
Sheet steel, per ton	70.00	180.00	380.00
Coal, per ton	5.6	34.00	90.00
Lubricating oils, per ton	60.00	300.00	950.00
Transportation per 100 kilometer	5.00	5.00	8.00
Wages of skilled workers	0.25	0.50	0.72
Wages of unskilled workers	0.20	0.40	0.56

At the Armistice, declares the Peugeot company, it was promised that coal would not exceed $11 per ton. In March, 1920, the cheapest coal cost $29.80 per ton. The following figures show the increases during the last fourteen months:

Price of Coal in France

	Jan. 1 1919.	April 16 1919.	July 1 1919.	Sept. 1 1919.	Nov. 1 1919.	Mar. 15 1920.	Increase Per Cent.
English coal	$16.20	$16.80	$24.40	$34.60	$37.60	$82.00	406
Sarre Valley coal	12.00	12.60	16.60	19.60	27.60	30.00	150
French coal	10.70	11.30	....	14.30	22.30	29.80	178

Raw material has kept pace with the rising cost of coal, as is shown by the following table:

					Per Cent
Copper, delivery Havre	$54.00	$42.10	$86.60	$123.80	129
Pure tin, "Detroit"	148.00	164.00	213.05	413.90	179
Lead, new, in Paris	none	17.10	24.00	56.65	231
Zinc, extra pure	26.50	31.00	37.10	63.15	138
Aluminum, pure, in ingots	78.00	96.00	98.00	178.00	128
Leather	41.20	84.00	125.20	138.00	254

The unfavorable rate of exchange on America and England is responsible for the greatly increased cost of much of the raw material. It is expected that within a few days the French Government will take vigorous action in order to reduce the high exchange, which is now standing at about 16 francs to the dollar and about 65 francs to the English pound. The importation of all luxuries and of many necessities will be forbidden, and among the things to be shut out will be automobiles and automobile trucks. It is also believed that there will be restrictions on gasoline imports, and in order to reduce consumption gasoline cards will be given out as during the war. When automobiles are used for commercial purposes users will be able to secure a liberal supply, but for all pleasure purposes there will be little or no gasoline. The present price of gasoline in the Paris district, but without the city tax, is $1.66 per American gallon at nominal exchange.

(Note.—Since this article was written, the French embargo on luxuries has been declared. It prohibits, among numerous other things, the importation of all automobile chassis having a weight of less than 2500 kilogs., about 5500 lb.)

The Cost of Commercial Flying

EXPERIENCE in the running of airplanes in civil service since the Armistice led Capt. P. D. Acland, of Vickers, Ltd., to put forward figures in a lecture recently before the British Royal Society of Arts. Captain Acland was intimately concerned with the Vickers-Vimy-Rolls Royce Transatlantic flight and those from England to Australia and from Cairo to Cape Town. In his lecture, he gave particulars of the makeshift organizations as to spares, supplies, and landing grounds, and emphasized the handicaps under which the flights were made on this account.

The type of machine to which the figures apply is a twin-engine Vimy with 350-hp. Rolls Royce Eagle engines, and although this type is capable of carrying 3000 lb. at full load, for purposes of the estimate an allowance of approximately 25 per cent is made—in other words, the load was put at 1 ton (2240 lb.). The service would be one between points 300 miles apart for conveyance, primarily, of mails and merchandise. Six machines would be allocated as follows:

Two flying.
Two standing by in case of necessity.
Two in the workshops undergoing overhaul.

The machines would be capable of flying at approximately 110 m.p.h. near the ground or 98 m.p.h. at 6000 ft. altitude. They would be commercialized Vimy "Bombers," which may be described as medium-sized airplanes.

Making due allowance for head winds, etc., the average speed is placed at 80 m.p.h. The approximate total flying hours is put at 7½ per day, and, allowing 5 per cent extra for running engines and testing, it is reckoned that in a year of 300 days the engines would be turning for 2360 hr.

It is further assumed that the machines would be used over an established flying route, necessitating the payment of standard fees for housing and landing. The necessary capital is put at $600,000, which includes six machines complete, two complete spare engines, 20 per cent value of machines and engines in spare parts, plant and equipment for terminal stations, suitable road transport, wireless equipment, advertising and $150,000 reserve for working capital.

The following are the estimated running expenses and upkeep:

1. Fuel. Petrol, 35 (Imperial) gal. per hr. for 2,360 hr. for all machines at 4s. per gal.	£16,520	$79,296
Oil, 2 gal. per hr. for 2,360 hr. for all machines at 10s. per gal.	2,360	11,328
2. Staff	8,820	42,330
3. Repairs, renewals and upkeep; spares, plant and equipment transport	13,600	65,280
4. Depreciation. At 400 hr. each machine, including equipment and transport	38,100	182,880
5. Insurance	11,500	55,200
6. Sundry expenses	3,000	14,400
	£93,900	$450,720

SUMMARY OF COSTS (NO ALLOWANCE FOR DIVIDEND).

Approximate total service flying hours at total running cost—
£93,900 ($450,720) = say, £42 ($201.6) per hr.

Approximate total miles covered on service, 80 x 2,250
= 10s. 6d. ($2.52) per mile

Weight carried per machine, 1 ton
= 10s. 6d. ($2.52) per ton mile
= 1s. 5d. ($0.34) per lb. for 300 miles.

"Taking a small view of aerial transport," says Captain Acland, "a figure of about 34 to 36 cents per lb. for transport over 300 miles in an airplane does not appear to be excessive, when one considers the large amount of perishable material there is requiring rapid transit between important points in various parts of the world. It would appear that, for a start at any rate, the normal charge of 60 cents per lb., which is being asked by most operating companies, appears to be fair and justified; in fact I go so far as to say that this may be on the low side. With an increase in business a profit should eventually be made, provided the public is educated to make use of flying machines for transport purposes, thus insuring the machines flying daily with a full load."

Individual Models of the British Marine Engine Builders

Eighteen of the better known British makes are described here by Mr. Bourdon, who ranges the various models and gives their specifications, weights and prices. The tables of specifications should be saved.

By M. W. Bourdon*

THE following abbreviated specifications of British marine engines of the gasoline and kerosene types afford an idea of the type of engine produced by the individual maker, together with the range of standard sizes, prices and weights. The prices quoted are based upon the normal rate of exchange.

Ailsa Craig.—One of the original makes of British motor boat engines bore this name. It is now made in two types with bores and strokes of 5 x 5½ and 4⅝ x 6 in. respectively. Both run at 900 r.p.m., have magneto ignition, impulse starter, hollow shaft lubrication, L head cylinders, centrifugal governor, piston water pump and gear oil pump. In a typical example, the 34-hp., four-cylinder 5 x 5½, the cylinders are cast in pairs; while the normal fuel is kerosene, either gasoline or a blow lamp directed on to the vaporizer may be used for starting, a special bracket for the blow lamp being provided. The water intake pipe is carried through the crankcase sump for cooling the lubricant, the water being circulated by a piston type pump operated through a connecting rod from an eccentric on the camshaft immediately in front of the flywheel. Lubrication is maintained by pressure throughout, for the oil is led from the hollow shaft and big-end bearings up to the piston pins. The valves of all Ailsa Craig engines have cast iron heads and nickel steel stems. They are medium weight motor boat engines, the four-cylinder model specified weighing approximately 1000 lb. and selling at $1,800. A single cylinder 9-hp. 4⅝ x 6-in. model is made, selling at $725 and weighing 560 lb.

Brooke.—Beyond a 3-hp., two-cycle, single-cylinder model, the makers of these engines are settling down to turning out two distinct types, one in two, three, four and six cylinder sizes, 3⅝ x 4¾, and the other with two, four and six cylinders, 5½ x 6 in. The first range is a light series and the other a heavier type of engine. The lightweight models range from 8 to 30 hp. and bear a closer resemblance to automobile practice than the heavy engines, which are rated at from 20 to 65 hp.

As exemplifying the 3⅝ x 4¾-in. range, the six-cylinder engine may be taken. While, as stated, this has current automobile practice prominently displayed, it differs noticeably in that the water and oil pumps are grouped in front of the distribution casing with the centrifugal governor. A special feature of the Brooke engines generally is found in this model, namely the oil jacketed induction manifold, which arrangement obviously serves not only to cool the lubricant, but also to assist in heating and vaporizing the ingoing mixture. The cylinders of this model are arranged in two blocks of three, with L heads, and are bolted to the cast iron crankcase, which has unusually large inspection doors on the left side, and has bolted to its rear end an extension casing to enclose the flywheel and reverse gear as a unit.

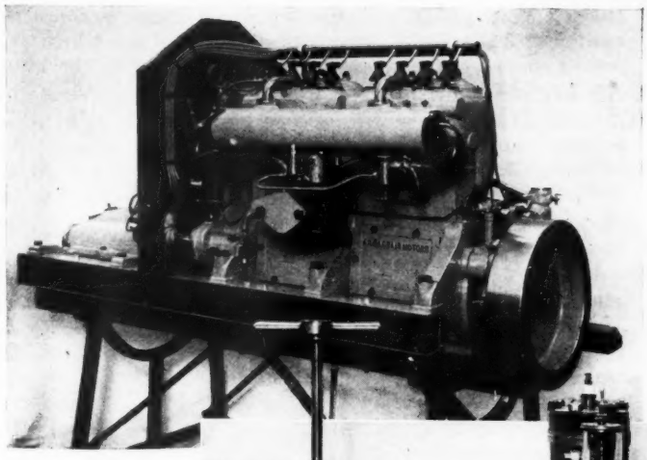
The arrangement of the water flow is unusual; the exhaust manifold is cast with each cylinder block and the water is led from the pump to the outside of the block on a level with the valve pockets. The cold water is thus taken first to the hottest part of the cylinders; thence it is carried across the heads and down the jackets, finding exit at the bottom of the latter on the right-hand or starboard side.

The crankshaft has seven journal bearings, consisting of three main journals and four subsidiary, the latter being between the crank throws and the cylinders of each block. In assembly, the shaft is threaded through the one-piece crankcase from the rear end, the bearing of that end being supported by a detachable plate. A gear type of oil pump is used with forced lubrication to the crankshaft bearings, splash serving for the big ends and cylinders. This engine with reverse gear is sold at $2,100 and weighs 1100 lb.

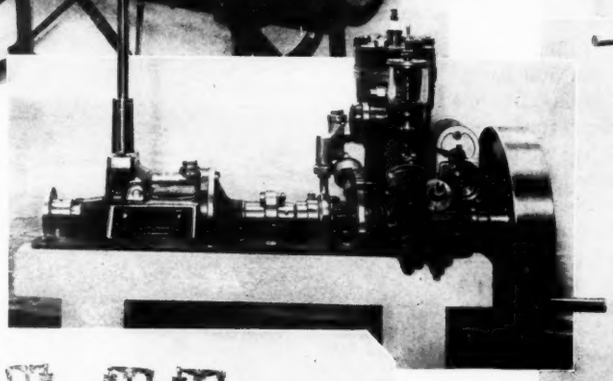
The heavy standardized type has separate T-head cylinders, and besides the oil cooling jacket around the induction pipe has a separate oil cooler on the port side of the crankcase. This consists of two concentric chambers through the inner of which the oil passes in its circuit, while the outer is in the run of the intake piping for the cooling water. The six-cylinder model of this range, termed 65 hp., weighs 2050 lb. and sells without reversing gear for $4500. This type of engine is designed primarily for the heavier type of pleasure craft, such as yachts and cabin cruisers, whereas the lighter range is particularly suitable for fast launches and half-deck cruisers. Both, however, run at approximately the same normal speed, namely 1000 r.p.m. This firm's products represent the highest class of workmanship, and they are extremely well finished, both internally and externally.

Dixon (D.B.&H.).—Standardized in three types, these engines run at 950 r.p.m. and are essentially suitable for using kerosene as fuel. The range of medium size, namely 4¾ x 6½, has separate T-head cylinders, whereas the others have L heads with overhead inlet valves operated by push rods; the cylinders in the latter case are also separately cast. Impulse starters for the magneto ignition are general. The latter applies also to crank starting, governor, gear type water and oil pumps and hollow shaft lubrication. The inlet manifolds are water jacketed, the water passing into the jacket just before it enters the muffler prior to its discharge into the exhaust pipe. To cool the lubricating oil the crank chamber has

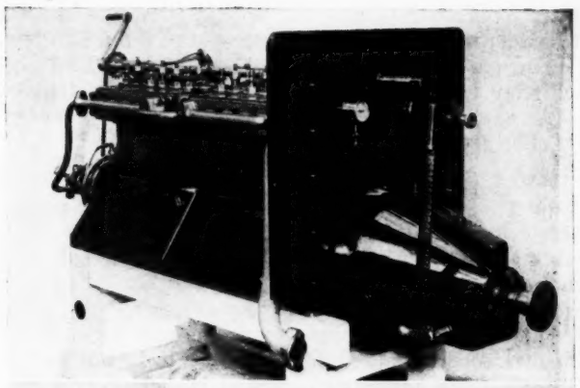
*Mr. Bourdon is the engineering correspondent of AUTOMOTIVE INDUSTRIES in the United Kingdom.

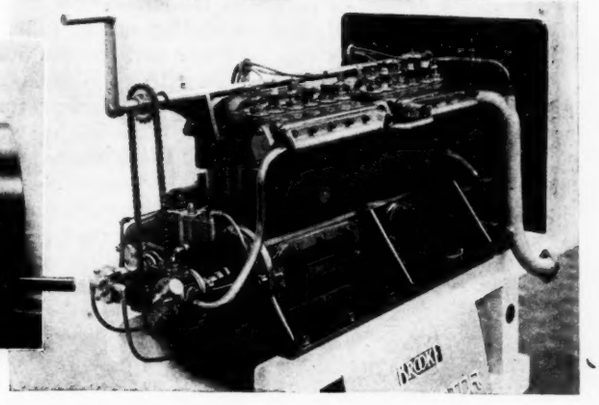


Above — The 34-hp. Ailsa Craig engine

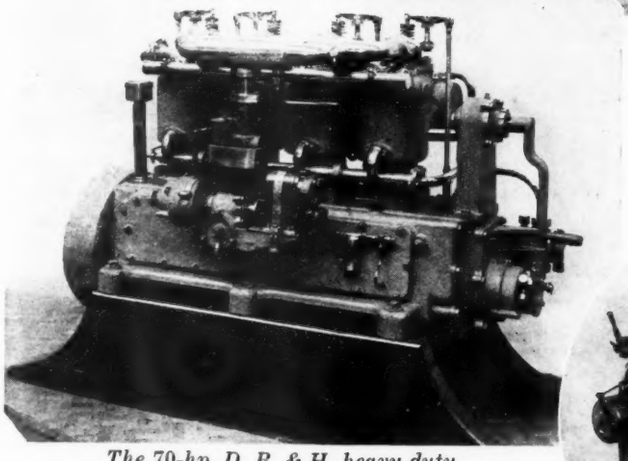


Right—The 3-hp. Brooke two-cycle engine

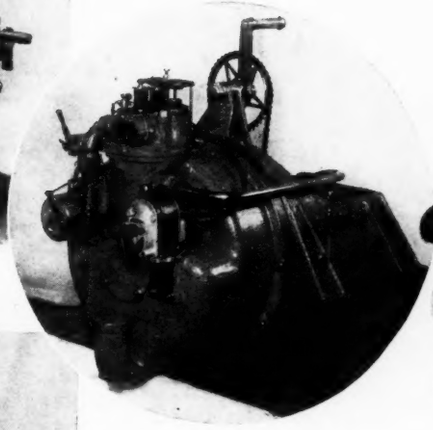




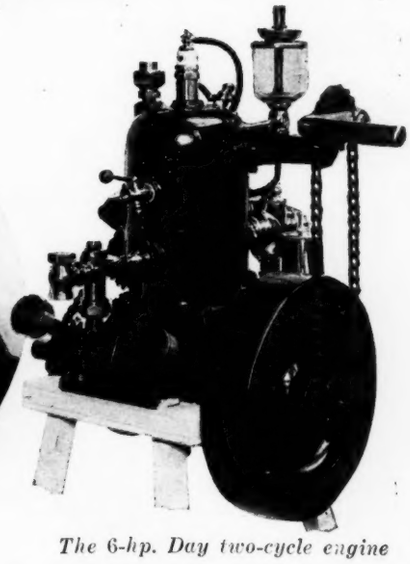
Two views of the 28-30 hp six cylinder Brooke



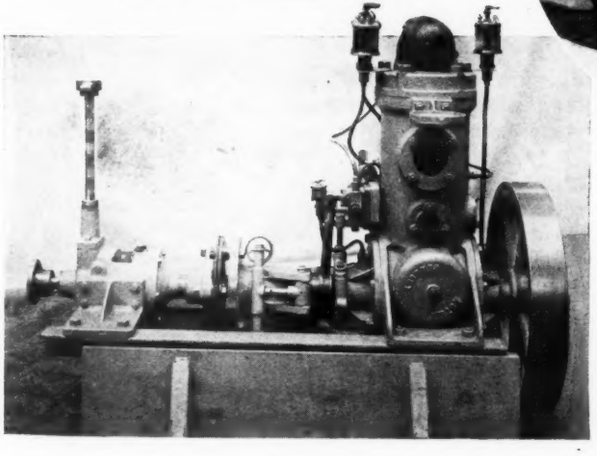
The 70-hp. D. B & H. heavy duty engine with overhead inlets



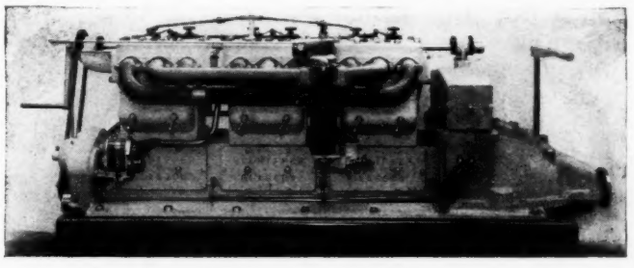
The 5-hp. Brotherhood



The 6-hp. Day two-cycle engine



The 6-hp. Aster semi-Diesel marine set. A good example of this type and size of engine which is now being produced by several British firms



The 75-hp. Gleniffer, a heavy duty type which has flywheel oil circulation with gravity feeds to the main crankshaft bearings

a false bottom through which the circulating water is drawn before reaching the pump. Prices and weights of this series may be exemplified by the 3-hp. single-cylinder four-cycle engine at $475, weight 180 lb.; the 12-hp. four-cylinder 3½ x 3½, $1,450, 700 lb.; 36-hp. four-cylinder, 4¾ x 6½, $2,450, 1450 lb., and the 90-hp. six-cylinder, $6,000, 2800 lb.

Aster.—This firm has a big range of marine engines, from two to eight cylinders, 7 to 90 hp. Included in the range are some of the few automobile type four-cylinder engines capable of running at higher speeds than are likely to be utilized for marine work. One of these is a four-cylinder block cast unit of 2 3/16 x 3 15/16 in.; it is termed 7 hp., which probably represents its capacity at its normal speed, namely 1100 r.p.m. It is not put forward for sea-going craft but for river launches; will run either on kerosene or gasoline, has circulating splash lubrication, sells at $950 without reversing gear and weighs 500 lb.

The induction system of a 28-hp. four-cylinder 4⅜ x 5½-in. model embodies two separate carbureters, one for gasoline and the other for kerosene. The latter is mounted on the left, at the front of the engine, its induction pipe passing through the exhaust manifold on that side and thence around the back of the cylinders to the induction manifold on the right. At the rear right-hand corner of the cylinder block is the gasoline carbureter, which has between it and the induction manifold a shut-off valve, distinct from the throttle, so that after starting has been accomplished on gasoline the mixture from this carbureter can be gradually cut off.

All Aster models are of the L-head type, including the eight-cylinder, 5¼ x 6 in., 90 deg. V engine, which is intended for cruisers. Although its normal speed is 900 r.p.m., it is intended to operate with a reducing gear bringing the propeller speed down to 300 or 350 r.p.m.

Brotherhood.—One model only is made, a single-cylinder of 5 hp., primarily intended as an auxiliary engine for sailing craft. This has a unit cast cylinder and crankcase enclosing a heavy flywheel, detachable head and overhead push-rod actuated valves. Splash lubrication is depended upon, while water circulation is maintained by a gear type pump driven by roller chain from the rear end of the crankshaft; it is fitted with a centrifugal type governor and sells at $545.

Day.—These engines, which bear the name of the originator of the valveless two-cycle type, are made in four models from 3 to 16 hp., and having either one or two cylinders. They have a special feature in the lubrication system, for, unlike prevailing designs of this type, they have an oil sump below the crankcase whence the lubricant is circulated by pressure set up within. This pressure arises in the crankcase proper, between which and the sump is a non-return valve. The crankcase compression thus indirectly forces the oil up from the sump to sight feed drips leading to the cylinder walls and to the crankcase. Surplus oil in the latter returns to the sump through the previously mentioned non-return valve, though it is not intended that a constant stream of oil should pass the sight feed drips, but merely approximately enough to serve for lubrication of the parts. Additional lubrication is provided for the main crankshaft bearings by compression grease cups. Examples of prices and weights are as follows: 3-hp. single-cylinder 3¼ x 3¼ engine, only $180, weight 75 lb.; complete installation, including reversing gear, propeller shaft and propeller, $240. Twelve hp. two-cylinder 4⅛ x 4½, $380, engine only, weight 300 lb.; complete installation, $560. All models have magneto ignition, and a gear type water pump driven by exposed skew gearing from the front end of the crankshaft.

Gleniffer.—This make is standardized as a range of three types, (1) two cylinders 4½ x 5, (2) two or four cylinders 5¾ x 7, (3) one and six cylinders 6 x 8 in. The two larger types run at 650 r.p.m. and the other at 850. All engines will burn either gasoline or kerosene, have magneto ignition with impulse starter, centrifugal governors, plunger water pumps and crank starting. L-head cylinders are used in all cases, but in the 6 x 8 in. type the valves are inclined at an angle of 45 deg., the stems projecting toward the left and being acted upon by long rocking levers, with roller ends applying to the cams. The valve system closely resembles that of the Guy truck engine which has been described in AUTOMOTIVE INDUSTRIES. The cylinder design differs, however, in that the detachable head is horizontal and not inclined as in the Guy, and has the usual water and compression joint between it and the cylinder proper.

The lubrication system on all except the small bore model is unusual in marine engines, for it resembles the Ford, in that the oil is circulated by the flywheel from a sump below the latter, being carried to the bearings from the flywheel casing by means of galleries and troughs. In the small two-cylinder engines a slight variation of this system consists of a disk between the crank throws, which serves in place of the flywheel to pick up oil from a sump. The following are examples of prices and weights: 10-hp. 4¼ x 5-in., two-cylinder, $640, 400 lb.; 40-hp., four-cylinder, 5¾ x 7-in., $2,250, 1900 lb.; 75-hp., six-cylinder, 6 x 8-in., $4,000 with reverse gear, 3350 lb.

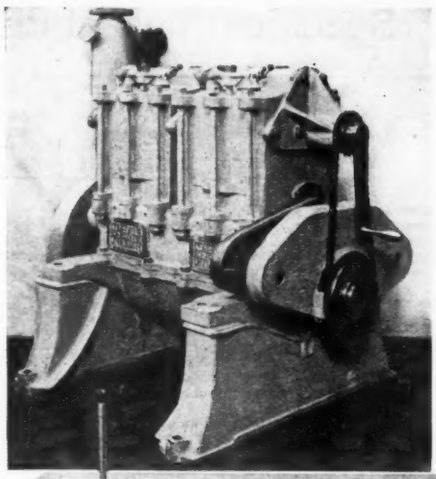
Spherota.—This is a new, heavy duty design, in which the makers aim at simplicity in manufacture and low cost of production. The pair cast T-head cylinders are secured to the top half of the crankcase, each by six long bolts passing through lugs projecting from the head. The cylinder casting encloses the valve stems with a spring-held cover plate over the inspection holes at the sides. Each block has integral inlet and exhaust passages, joined at the center between the pairs by bolt-held flanges. Camshafts are of cast steel with grooves between the cams and are driven by straight toothed pinions.

The water flow through the jacket is led first to the exhaust side and then directed by internal webs to the inlet side; thence the circulation continues to the kerosene vaporizer which has three concentric compartments; the outer forms a water jacket, through the intermediate pass the exhaust gases, while the center represents a portion of the induction system. Thus the exhaust gases are cooled by both water and fresh mixture and serve to heat the latter to assist vaporization.

Splash lubrication is depended upon, with drip feeds to maintain the level in crankcase troughs. An impulse starter is fitted in conjunction with the magneto ignition; the starting crank, which connects to the crankshaft by 2 to 1 gearing, has a ratchet device which throws out of engagement if a backfire should occur. Water circulation is by a centrifugal type pump.

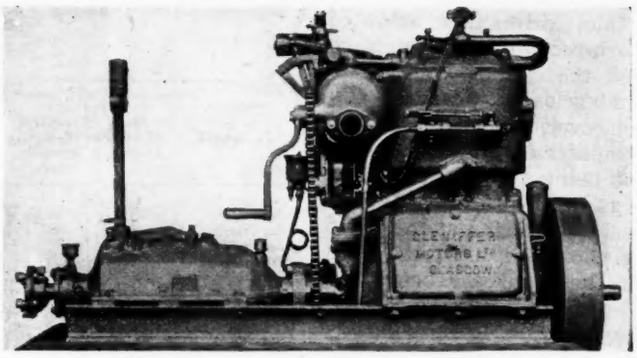
This peculiar design presents a clean but rugged exterior, noticeable on account of the absence of exposed pipes and manifolds. The normal speed is 1000 r.p.m.; the weight of the four-cylinder model is 680 lb. and the price $1,400. One and two cylinder models are also made, all three having the same bore and stroke (4¼ x 5½ in.) and with all parts interchangeable except crankshaft, crankcase, camshafts, and the single-cylinder block.

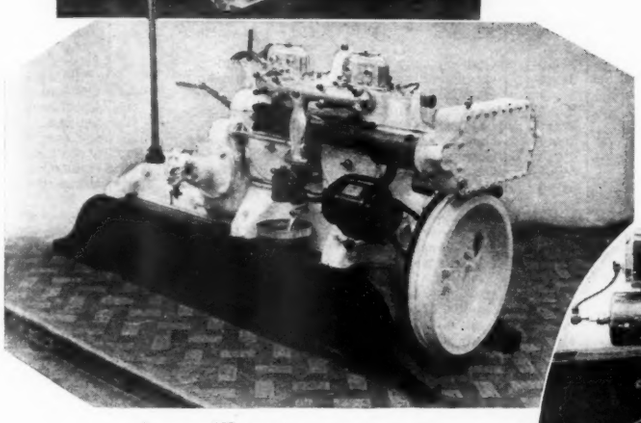
Thornycroft.—This well-known make of gasoline-kerosene-marine engines is made in six models with four variations in bore and stroke. The smallest is a two-cylinder 4½ x 6, the same dimensions occurring in a four-cylinder outfit. A post-war model has four cylinders 4 x 5½ with detachable heads on pair-cast cylinders; over-



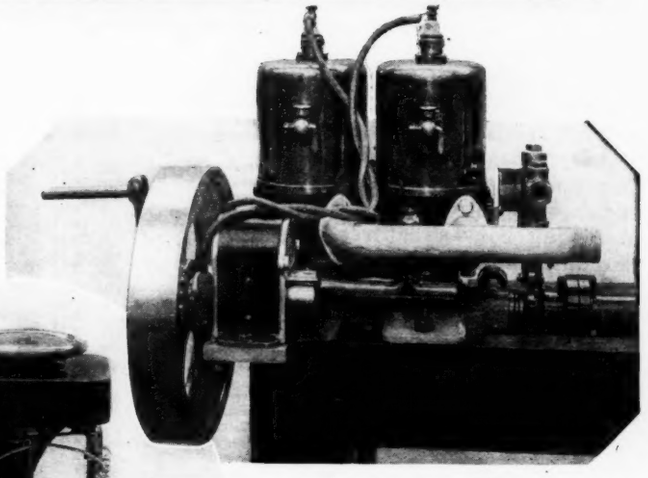
Left — The Spherota marine engine

Right — The 18-22 hp two-cylinder Gleniffer paraffin engine and reverse set

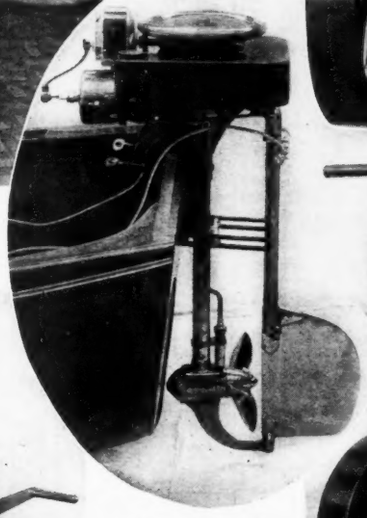




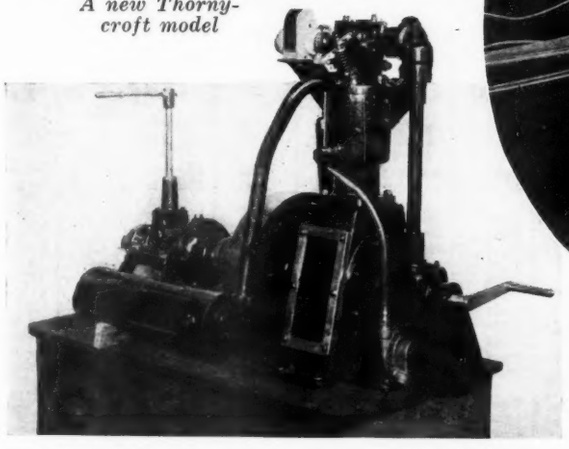
A new Thornycroft model



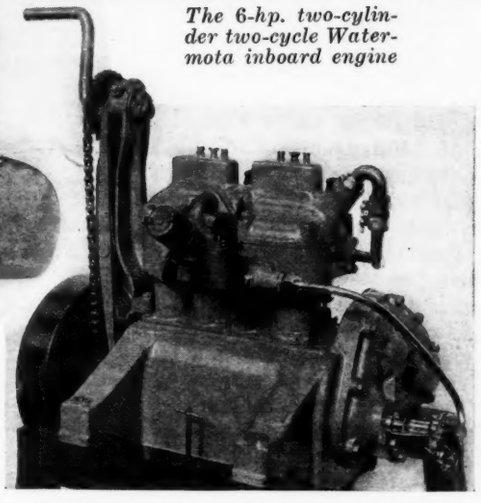
The 6-hp. two-cylinder two-cycle Watermota inboard engine



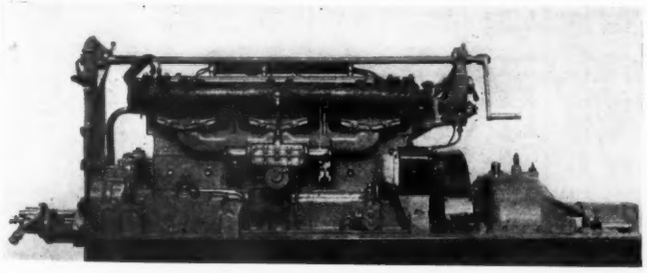
The only British outboard set, a Watermota



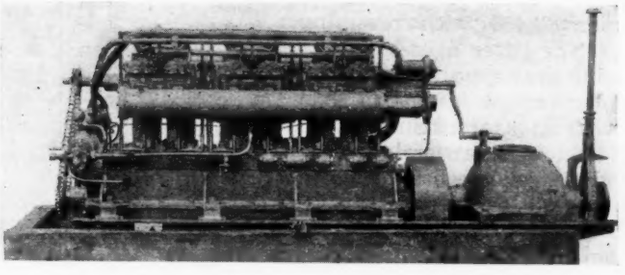
The 10-hp. 4⅛ x 6 in. Wasp single-cylinder four-cycle engine with an overhead camshaft. Designed for quantity production, this engine weighs 350 lb. and sells at £110



The 7-hp. Wolseley with block cast cylinders, detachable head and overhead inlets



The six-cylinder Wolseley marine engine, 4¾ x 5¾, a modified car type with cast-iron crankcase, L-head pair cast cylinders and kerosene vaporizer. The reversing gear is of the bevel type controlled by magneto clutches



The 70-hp. Thornycroft six-cylinder 4 x 7 in engine, which has overhead inlet valves and runs at 1400 r.p.m. It is intended for highspeed craft to run on gasoline, and is equipped with either electric or compressed air starting system

head inlet valves are actuated by push-rods passing upward through the cylinder casting to rockers enclosed by a cast aluminum cover, which has an upper compartment for oil, the lubricant being fed to the rocker bearings by a wick system. The flywheel is arranged at the front end of the crankshaft, the rear end of the crankcase being extended to form a housing for the reverse gear. A circulating splash system of lubrication is used, with a gear type oil pump driven at one end of a transverse shaft, the other end operating the magneto. This transverse shaft also bears the centrifugal type governor. The exhaust manifold is ribbed and leads directly into an expansion and cooling box—a flat rectangular unit immediately over the flywheel, through which circulating water is carried. No special form of vaporizer is fitted for kerosene, but a very large hot air muff is located around the short exhaust pipe between the manifold and the muffler. This plant weighs with the reverse gear 1350 lb. and is sold at $2,200.

The largest six-cylinder model, termed 70 hp., has a bore and stroke of 4 x 7 in. and a normal speed of 1400 r.p.m. The cylinders are cast in pairs and have L heads with overhead inlet valves operated by push rods, the valves and rockers in this case being exposed. A peculiar feature is the yoke which holds down the cages of the overhead inlet valves; it is a W-shaped unit duplicated, and bearing between the outer arms the pivot pins of the valve rockers, while a single nut screwed to a stud passing up through the center holds it in position and maintains pressure upon the cages. This engine is a model for fast craft and weighs 1150 lb.; it sells at $2,950 for the motor only or $3,450 with reversing gear. The latter may be of the reducing gear type, bringing the propeller speed down to 350 r.p.m. from a crankshaft speed of 1400. The reversing gear embodies a silent chain drive to an overhead layshaft and thence back to the propeller shaft extension by straight-toothed pinions; this constitutes one of the few examples of the use of silent chains.

Wasp.—One type of engine

Specifications of the

NAME	H.P.	No. of Cylinders	Two or Four-Cycle	Bore and Stroke	Type	Normal Speed	Ignition	Impulse Starter
Ailsa Craig	17	2	4	5 x5½	Kerosene	900	Magneto	Yes
Ailsa Craig	34	4	4	5 x5½	Kerosene	900	Magneto	Yes
Ailsa Craig	50	6	4	5 x5½	Kerosene	900	Magneto	Yes
Ailsa Craig	9	1	4	4⅝x6	Kerosene	900	Magneto	Yes
Ailsa Craig	24	3	4	4⅝x6	Kerosene	900	Magneto	Yes
Aster	7	4	4	2 1/16x3 15/16	Gasoline or kerosene	1100	Magneto	No
Aster	9	2	4	3½x4¾	Gasoline or kerosene	900	Magneto	No
Aster	18	4	4	3½x4¾	Gasoline or kerosene	900	Magneto	No
Aster	14	2	4	4⅜x5½	Gasoline or kerosene	900	Magneto	No
Aster	28	4	4	4⅜x5½	Gasoline or kerosene	900	Magneto	No
Aster	45	4	4	5¼x6	Gasoline or kerosene	900	Magneto	No
Aster	90	8	4	5¼x6	Gasoline or kerosene	900	Magneto	No
Atlantic	15	2	4	5½x7	Kerosene	550	Magneto	Yes
Atlantic	30	4	4	5½x7	Kerosene	550	Magneto	Yes
Atlantic	20	4	4	4 x5	Kerosene	1000	Magneto	Yes
Atlantic	35	4	4	6 x8	Kerosene	550	Magneto	Yes
Atlantic	60	6	4	6 x8	Kerosene	550	Magneto	Yes
Brooke	3	1	2	3⅜x3¼	Gasolene	850	Magneto	No
Brooke	4	1	4	3⅝x4¼	Gasoline or kerosene	950	Magneto	Optional
Brooke	8	2	4	3⅝x4¾	Gasoline or kerosene	950	Magneto	Optional
Brooke	14	3	4	3⅝x4¾	Gasoline or kerosene	950	Magneto	Optional
Brooke	18	4	4	3⅝x4¾	Gasoline or kerosene	950	Magneto	Optional
Brooke	30	6	4	3⅝x4¾	Gasoline or kerosene	1200	Magneto	Optional
Brooke	20	2	4	5½x6	Gasoline or kerosene	1000	Magneto and battery	Optional
Brooke	45	4	4	5½x6	Gasoline or kerosene	1000	Magneto and battery	Optional
Brooke	65	6	4	5½x6	Gasoline or kerosene	1000	Magneto and battery	Optional
Day	3	1	2	3¼x3¼	Gasoline or kerosene	900	Magneto	No
Day	6	1	2	4½x4½	Gasoline or kerosene	850	Magneto	No
Day	12	2	2	4½x4½	Gasoline or kerosene	850	Magneto	No
Day	16	2	2	4¾x5	Gasoline or kerosene	800	Magneto	No
Dixon	3	1	4	3½x3½	Gasoline or kerosene	950	Magneto	Yes
Dixon	6	2	4	3½x3½	Gasoline or kerosene	950	Magneto	Yes
Dixon	12	4	4	3½x3½	Gasoline or kerosene	950	Magneto	Yes
Dixon	9	1	4	4¾x6½	Kerosene	900	Magneto	Yes
Dixon	18	2	4	4¾x6½	Kerosene	900	Magneto	Yes
Dixon	27	3	4	4¾x6½	Kerosene	900	Magneto	Yes
Dixon	36	4	4	4¾x6½	Kerosene	900	Magneto	Yes
Dixon	60	6	4	4¾x6½	Kerosene	900	Magneto	Yes
Dixon	70	4	4	6 x6½	Kerosene	950	Magneto	Yes
Dixon	90	6	4	6 x6½	Kerosene	950	Magneto	Yes
Djinn	5	1	4	4 x5	Kerosene	1100	Magneto	No
Djinn	15	2	4	4½x6	Kerosene	800	Magneto	No
Djinn	30	2	4	6½x8¾	Kerosene	500	Magneto and battery	No
Djinn	40	4	4	5½x7½	Kerosene	650	Magneto and battery	No
Djinn	90	6	4	6½x8¾	Kerosene	600	Magneto and battery	No
Fyfe Wilson	10	4	4	2⅝x4⅜	Gasoline or kerosene	1000	Magneto	No
Fyfe Wilson	20	4	4	3½x5	Gasoline or kerosene	1000	Magneto	No
Gardner	18*	4	4	4 x4½	Kerosene	1000	Magneto	No
Gardner	60*	3	4	8 x8½	Kerosene	500	Magneto	No
Gleniffer	10	2	4	4¼x5	Kerosene	800	Magneto	Yes
Gleniffer	18	2	4	5¾x7	Kerosene	650	Magneto	Yes
Gleniffer	40	4	4	5¾x7	Kerosene	650	Magneto	Yes
Gleniffer	12	1	4	6 x8	Kerosene	650	Magneto	Yes
Gleniffer	75	6	4	6 x8	Kerosene	650	Magneto	Yes
Green	35	4	4	4 1/16x4¾	Gasoline	1200	Magneto	No
Green	100	6	4	5½x6	Gasoline	1250	Magneto	No
Green	160	6	4	5½x7	Gasoline	1200	Magneto and battery	No
Green	300	12	4	5½x7	Gasoline	1200	Magneto and battery	No
Green	450	18	4	5½x7	Gasoline	1200	Magneto and battery	No
Parsons	7	1	4	4½x6	Kerosene	850	Magneto	No
Parsons	14	2	4	4½x6	Kerosene	850	Magneto	No
Parsons	21	3	4	4½x6	Kerosene	850	Magneto	No
Parsons	28	4	4	4½x6	Kerosene	850	Magneto	No
Parsons	42	6	4	4½x6	Kerosene	850	Magneto	No
Parsons	30	2	4	6½x8	Kerosene	650	Magneto and battery	No
Parsons	45	3	4	6½x8	Kerosene	650	Magneto and battery	No
Parsons	60	4	4	6½x8	Kerosene	650	Magneto and battery	No
Parsons	90	6	4	6½x8	Kerosene	650	Magneto and battery	No
Spherota	7½	1	4	4¼x5½	Kerosene	1000	Magneto	Yes
Spherota	15	2	4	4¼x5½	Kerosene	1000	Magneto	Yes
Spherota	30	4	4	4¼x5½	Kerosene	1000	Magneto	Yes
Thornycroft	15	2	4	4½x6	Kerosene	1000	Magneto	No
Thornycroft	30	4	4	4½x6	Kerosene	1000	Magneto	No
Thornycroft	21	4	4	4 x5½	Kerosene	1000	Magneto	No
Thornycroft	70	6	4	4 x7	Gasoline	1400	Magneto and battery	No
Thornycroft	47	4	4	6 x8	Kerosene	750	Magneto	No
Thornycroft	70	6	4	6 x8	Kerosene	750	Magneto	No
Wasp	10	1	4	4⅛x6	Kerosene	800	Magneto	No
Wolseley	7	4	4	2 7/16x3½	Gasoline	1050	Magneto	No
Wolseley	18	4	4	3 1/16x4¾	Gasoline or kerosene	1000	Magneto	No
Wolseley	30	6	4	3⅜x5⅛	Gasoline or kerosene	1000	Magneto	No
Wolseley	60	6	4	4¾x5¾	Gasoline or kerosene	1000	Magneto	No
Watermota	3	1	2	2⅝x2⅝	Gasoline outboard	800	Magneto	No
Watermota	4	1	2	2¾x3	Gasoline outboard	800	Magneto	No
Watermota	4	1	2	2¾x3	Gasoline inboard	800	Magneto	No
Watermota	6	2	2	2¾x3	Gasoline inboard	800	Magneto	No
Watermota	12	2	2	4 x4	Gasoline inboard	800	Magneto	No

*Typical of a range of thirty engines with one to six cylinders, of 5 hp. to 220 hp., and dimensions of 4 x 4½ to 11 x 10 in.

British Marine Engines

Lubrication System	Valve Arrangement	Starting System	Governor Fitted	Water Pump Type	Oil Pump Type	Prices at Normal Rate of Exchange: Engine Only	Engine and Reverse Gear	Complete Installation	Weight Engine Only Lb.
Hollow shaft	L	Crank	Yes	Piston	Gear	$1150	$1300	$1500	720
Hollow shaft	L	Crank	Yes	Piston	Gear	1800	2000	2200	1000
Hollow shaft	L	Crank	Yes	Piston	Gear	2600	3100	3350	1400
Hollow shaft	L	Crank	Yes	Piston	Plunger	725	850	1000	560
Hollow shaft	L	Crank	Yes	Gear	Gear	1450	1650	1800	1100
Circ. splash	L	Crank or electric	Yes	Gear	Gear	950	1100	1200	500
Hollow shaft	L	Crank or electric	Yes	Gear	Gear	800	1000	1100	600
Hollow shaft	L	Crank or electric	Yes	Gear	Gear	1300	1600	1700	900
Hollow shaft	L	Crank or electric	Yes	Gear	Gear	1050	1150	1750	750
Hollow shaft	L	Crank or electric	Yes	Gear	Gear	1800	2100	2250	1300
Hollow shaft	L	Crank or electric	Yes	Gear	Gear	2000	2500	2750	1650
Hollow shaft	L	Crank or electric	Yes	Gear	Gear	4400	5000	5500	2800
Drip and splash	L	Crank	Yes	Piston	None	1000	1150	1400	970
Drip and splash	L	Crank	Yes	Piston	None	1550	1650	1900	1340
Drip and splash	L	Crank	Yes	Piston	None	950	1050	1150	845
Drip and splash	L	Crank	Yes	Piston	None	2150	2300	2600	1950
Drip and splash	L	Crank	Yes	Piston	None	3000	3200	3600	2100
Splash	.....	Crank	No	Plunger	Gear	220	280	320	140
Splash	T	Crank	Yes	Eccentric	Gear	360	450	500	200
Pressure and splash	T	Crank	Yes	Eccentric	Gear	700	800	850	400
Pressure and splash	L	Crank	Yes	Eccentric	Gear	1000	1200	1320	600
Pressure and splash	T	Crank	Yes	Eccentric	Gear	1700	1900	2100	920
Pressure and splash	L	Crank	Yes	Eccentric	Gear	2100	2350	2500	1100
Pressure and splash	T	Crank	Yes	Eccentric	Gear	1650	2100	2250	1100
Pressure and splash	T	Crank	Yes	Eccentric	Gear	3250	3700	4000	1750
Pressure and splash	T	Crank	Yes	Eccentric	Gear	4500	5000	5400	2050
Pressure and drip	.....	Crank	No	Gear	None	180	240	300	75
Pressure and drip	.....	Crank	No	Gear	None	250	340	400	175
Pressure and drip	.....	Crank	No	Gear	None	380	480	560	300
Pressure and drip	.....	Crank	No	Gear	None	480	640	750	450
Hollow shaft	O. inlet	Crank	Yes	Gear	Gear	475	560	670	180
Hollow shaft	O. inlet	Crank	Yes	Gear	Gear	850	950	1050	392
Hollow shaft	O. inlet	Crank	Yes	Gear	Gear	1450	1600	1700	700
Hollow shaft	T	Crank	Yes	Gear	Gear	1000	1250	1400	630
Hollow shaft	T	Crank	Yes	Gear	Gear	1600	1900	2100	830
Hollow shaft	T	Crank	Yes	Gear	Gear	2000	2300	2500	1200
Hollow shaft	T	Crank	Yes	Gear	Gear	2450	2900	3100	1450
Hollow shaft	T	Crank	Yes	Gear	Gear	3400	4000	4250	1900
Hollow shaft	O. inlet	Crank	Yes	Gear	Gear	4400	5000	5500	2070
Hollow shaft	O. inlet	Crank	Yes	Gear	Gear	6000	6800	7300	2800
Splash	L	Crank	No	Gear	None	.....	450	540	220
Circ. splash	L	Crank	No	Piston	Piston	.....	1450	1600	900
Circ. splash	L	Crank	Yes	Piston	Piston	.....	2500	2900	3920
Hollow shaft	L	Crank	No	Piston	Piston	.....	3000	3400	3900
Hollow shaft	L	Crank	No	Piston	Piston	.....	7500	9000	7800
Hollow shaft	L	Crank	No	Eccentric	Gear	500	740	830	280
Hollow shaft	L	Crank	Yes	Gear	Plunger	900	1300	1400	450
Pressure and splash	O. inlet	Crank	Yes	Gear	Gear	1300	1500	2000	670
Hollow shaft	T	Crank	Yes	Gear	Gear	4000	4400	4800	5800
Circ. splash	L	Crank	Yes	Piston	Disc	640	970	1050	400
Circ. splash	L	Crank	Yes	Piston	Disc	1200	1500	1700	1350
Circ. splash	L	Crank	Yes	Piston	Flywheel	2250	2700	3050	1900
Splash	L	Crank	Yes	Piston	None	.....	1100	1300	1400†
Circ. splash	L	Crank	Yes	Piston	Flywheel	.....	4000	4400	3350†
Hollow shaft	Overhead	Electric	No	Gear	Gear	1425	.....	.....	250
Hollow shaft	Overhead	Electric	No	Gear	Gear	4000	.....	.....	590
Hollow shaft	Overhead	Electric	No	Gear	Gear	6650	.....	.....	900
Hollow shaft	Overhead	Comp. air	No	Gear	Gear	12000	.....	.....	1250
Hollow shaft	Overhead	Comp. air	No	Gear	Gear	.....	.....	.....	1850
Hollow shaft	L	Elec. optional	Optional	Eccentric	Gear	650	.....	950	420
Hollow shaft	L	Elec. optional	Optional	Eccentric	Gear	1000	.....	1350	690
Hollow shaft	L	Elec. optional	Optional	Eccentric	Gear	1250	.....	1800	800
Hollow shaft	L	Elec. optional	Optional	Eccentric	Gear	1450	.....	2100	1100
Hollow shaft	L	Elec. optional	Optional	Eccentric	Gear	1930	.....	2600	1400
Hollow shaft	L	Elec. optional	Yes	Eccentric	Piston	1900	.....	2900	2000
Hollow shaft	L	Elec. optional	Yes	Eccentric	Piston	2400	.....	3500	2400
Hollow shaft	L	Elec. optional	Yes	Eccentric	Piston	2850	.....	4200	3200
Hollow shaft	L	Elec. optional	Yes	Eccentric	Piston	3900	.....	5200	4400
Splash	T	Crank	No	Centrif.	None	750	.....	.....	340
Splash	T	Crank	No	Centrif.	None	900	.....	.....	450
Splash	T	Crank	No	Centrif.	None	1400	.....	.....	680
Circ. splash	L	Crank	Yes	Gear	Gear	1250	1300	1700	900
Circ. splash	L	Crank	Yes	Gear	Gear	1900	2400	2700	1300
Circ. splash	O. inlet	Crank	Yes	Gear	Gear	.....	2200	2400	1350
Circ. splash	O. inlet	Crank	No	Gear	Gear	2950	3450	3650	1150
Circ. splash	O. inlet	Crank	Yes	Gear	Gear	3300	4150	4500	2800
Circ. splash	O. inlet	Crank	Yes	Gear	Gear	4100	5350	6000	3900
Splash	Overhead	Crank	No	Centrif.	None	515	625	780	350
Circ. splash	O. inlet	Crank	No	Gear	Gear	740	.....	1100	220
Pressure and splash	L	Crank	No	Gear	Gear	1550	.....	1975	670
Pressure and splash	L	Crank	No	Gear	Gear	1900	.....	2400	875
Pressure and splash	L	Crank and elec.	No	Gear	Gear	3550	.....	3400	1300
With fuel	.....	Flywheel	No	Gear	None	.....	.....	210	60††
With fuel	.....	Flywheel	No	Gear	None	.....	.....	260	100††
With fuel	.....	Crank	No	Plunger	None	130	.....	200	50
With fuel	.....	Crank	No	Plunger	None	215	.....	295	90
With fuel	.....	Crank	No	Plunger	None	.....	.....	.....	150

†With reverse gear. ††Complete.

only, this being a single cylinder, 4⅛ x 6, with overhead camshaft operating the valves through rockers. It is put forward as a type which can and will be produced in large quantities at a low price, though the present charge is $515 for the engine only, which weighs 350 lb. The cylinder, detachable from the crankcase, has a detachable head, the camshaft being operated by an enclosed vertical shaft and bevel gearing. The crankcase has long inspection hole covers at each side, through which the piston and connecting rod can be removed if necessary; it is cast in one piece, with the exception of the front end plate, which carries the crankshaft bearing and has formed with it half of the casing for the distribution gear. Ignition is by magneto, driven from a rearward extension of the overhead camshaft through a flexible coupling. It has a medium speed and burns either gasoline or kerosene.

Watermota. — This solitary representative of British outboard engines follows in general arrangement the two-stroke plants of this type made in the United States. In detail, however, it varies considerably. In the first place the cast iron horizontal cylinder has a copper water jacket in one piece, secured as to its inner end to the cylinder by means of a steel ring pressed over it. In the center of the head the spark plug is screwed into a sleeve threaded internally and externally, which serves to make a water joint by holding the copper jacket firmly against an outstanding boss of the cast iron cylinder.

These outfits are made in two sizes, both with one cylinder, the dimensions being respectively 2⅝ x 2⅝ and 2¾ x 3 in. In both cases ignition is by a separate magneto, driven through bevel gearing from the upper extension of the crankshaft and supported by a bracket over the cylinder. An aluminum piston is used, with a deep deflector standing out from the crown and two rings above the piston pin.

A commendable feature lies in the provision of a ball thrust bearing on the vertical crankshaft below the crank web, between the latter and the casing of the propeller shaft, thus taking the weight of the unit and

tending to maintain alignment between crankpin and cylinder bore. The upper journal bearing of the crankshaft is lubricated by wick feed from a large oil lubricator standing up from the center of the flywheel which, as in other outboard motors, surmounts the whole unit. Cylinder and crankcase lubrication, together with that of the lower journal bearing is maintained on the petroil system, a definite quantity of lubricating oil being used with the gasoline. The water pump is within the propeller bevel gear casing and is of the straight pinion type.

The makers of these outboard units also manufacture inboard engines, designed on similar lines with copper water jackets and made in one and two cylinder models. They are two-cycle, with crankcase compression and have compression grease cups for the journal bearings. The water pump in these models is of the plunger type, driven by an eccentric from the crankshaft extension. These inboard units are made in two sizes, namely 2¾ x 3 and 4 x 4; they are of light weight and, like the outboard models, sell at a low figure. An idea of prices and weights can be gained from the following examples: The larger outboard set sells at $260 and weighs 100 lb., while the two-cylinder 2¾ x 3 inboard engine weighs 90 lb. and is priced at $295.

Wolseley.—Range of four models all greatly reminiscent of pre-war car engines, modified for marine purposes by the use of cast steel for crankcases and water-cooled exhaust manifolds. Smallest size is termed 7 hp., and is a four-cylinder unit designed originally for the 1914 Wolseley-Stellite light car. In the latter it was rated at 10 hp., having a bore and stroke of 2 7/16 x 3½ and running up to 2500 r.p.m. For marine work it does not exceed 1200 r.p.m., hence its lower rating. It has block cast cylinders, detachable head and enclosed overhead inlet valves operated by push rods. The carbureter, using gasoline, is bolted to the detachable head and has its water jacket in direct communication with the head jacket. Designed for thermo-syphon cooling in a car, for marine work this engine has a water circulating pump carried on a bracket in front of the timing case and driven by a dog clutch from the end of the crankshaft, taking the place of the starting crank. Starting is by elevated crank handle through chain drive to claw clutches on the inner boss of the flywheel. Lubrication is by gear pump and troughs, and ignition by magneto. The crankcase is a unit construction with shallow detachable oil pan forming sump, the shaft being threaded through a large hole at the rear end normally closed by a plate forming the support for the main bearing at that end. The engine alone weighs 220 lb. and is sold at $740.

Another four-cylinder model has pair-cast L-head cylinders, 3½ x 4¾ in., and develops 16 b.h.p. at 1000 r.p.m. on kerosene, or 18 b.hp. on gasoline. This and the two six-cylinder engines, respectively 3¾ x 5⅛ in. and 4¾ x 5¾ in., have gear oil pumps, pressure lubrication to the main bearings and troughs for the big ends. No provision is made for oil cooling. Prices and weights for engine only are: 18-hp., four-cylinder, $1,550, 670 lb.; 30-hp., six, $1,900, 875 lb.; 60-hp., six, $3,550, 1300 lb.

Atlantic.—Three standard types are made in two, four and six cylinders. Two of the three are low-speed engines running on kerosene at a normal speed of 550 r.p.m.; the other is a lighter plant running at 1000 r.p.m.; both are more suitable for heavy boats than for light pleasure craft. The flywheel is at the front end of the crankshaft, a rear extension of the latter carrying the driving pinion of the reverse gear. Lubrication is by sight feed drips to main bearings and splash from troughs formed by transverse webs at the bottom of the crankcase. A large quantity of lubricant is always retained in the crankcase, and through it passes for cooling purposes the intake pipe of the water pump; the latter is of the piston type, driven by an eccentric and a coupling rod from the reverse layshaft. Coupled compression release cocks pass through the water jackets and cylinder walls at half stroke. A prominent feature is the exhaust cooling chamber; this takes the form of an oblated spheroid into which the water enters at the top after leaving the cylinders and falls on to a baffle under which is the upstanding outlet pipe from the exhaust manifold; gases and water merge, the former are cooled and the two find exit together at the bottom of the chamber into the open air by way of a suitably arranged pipe. The 20-hp. 4 x 5-in. four-cylinder engine model is sold at $950 and weighs 845 lb. The largest engine of the range is a six-cylinder 6 x 8-in., which runs at 550 r.p.m., weighs 2100 lb. and sells at $3,000.

Djinn.—These are heavy duty engines more particularly suited to commercial craft use, for instance, for fishing and harbor duties. They are essentially kerosene engines, the range comprising one, two, four and six cylinders, all excepting the first having the reversing gear fitted as an extension of the engine base. A special feature of the design is that the cylinders are bolted to the bottom half of the crankcase, the top half merely serving as an intermediate casing carrying very large inspection doors through which the pistons and connecting rods, main bearings and camshaft can be removed. The four-cylinder model, termed 40-hp., has a bore and stroke of 5½ x 7½ in. and runs at 650 r.p.m. It is fitted with two ignitions — magneto and battery — crank starting and plunger (piston) pumps. The latter consist of four units all operated by a single eccentric, these units serving respectively as fuel, oil and water circulating and bilge pumps. An idea of the type of this engine can be gained from its weight, which is 3900 lb.; complete with reversing gear it sells at $3,000. The single-cylinder model 5½ hp. (4 x 5 in.) runs at 1110 r.p.m., has magneto ignition and splash lubrication from a drip feed; a gear type water pump is fitted in this case and the engine weighs 220 lb., selling with reversing gear at $450.

Gardner.—Made by an old established gas engine firm, the Gardner engines for marine purposes are of the semi-Diesel and gasoline-kerosene four-stroke types. One range of the latter is 4 x 4½-in. bore and stroke with two, three or four L-head cylinders with overhead inlet valves. The largest, termed 18-20 hp., weighs 670 lb. and sells at $1,300; the normal speed is 1000 r.p.m., controlled by a centrifugal governor. The lubrication system is out of the ordinary; a gear pump delivers the oil through individual sight feeds, whence it runs by gravity to each of the main crankshaft bearings; the shaft is drilled from journals to pins and the lubricant is carried to the latter by centrifugal action, splash serving for cylinders and piston pins.

Among the other ranges is a heavy type three-cylinder 8 x 8½-in. kerosene model, this having hollow shaft lubrication, T-head cylinders, magneto ignition and a normal speed of 500 r.p.m. A separate vaporizer with a water drip into the induction pipe is fitted for each cylinder, three blow lamps being used for starting. Governing is by means of a variable inlet valve lift. This engine sells at $4,000 and weighs 5800 lb.

Fyfe Wilson.—These are assembled sets with British components, engines being of the light car type modified to suit river craft. The aluminum crankcases are retained, but although the engines are designed for thermo-syphon water circulation, a water pump is fitted in front of the distribution casing. In one model, a rear extension of the pump shaft carries an enclosed centrifugal governor

acting on the carbureter throttle. Although these engines were originally designed for automobile use with gasoline, they have been adapted for kerosene, but run at 1000 r.p.m. instead of their normal speed of 2000 r.p.m. in cars. Two models are made, both with four cylinders, one, the 10 hp., having a bore and stroke of 2⅝ x 4⅜ in., and the other, termed 20 hp., 3½ x 5. Both have hollow shaft lubrication, L-head cylinders, magneto ignition. The 10-hp. sells at $500 and weighs 280 lb., while the larger model is priced at $900 and weighs 450 lb.

Green.—The engines bearing this name are of the airplane type with separate cylinders having copper water jackets, overhead camshaft, and valves in cages operated by rocking levers. Aluminum is used for the crankcases, and all models except the four-cylinder have a journal bearing between each pair of crank throws. The range of standard models comprises the following: 35-h.p., four-cylinder, 4 3/16 x 4¾ in.; 100 hp., six-cylinder, 5½ x 6 in.; 160-hp., six-cylinder, 5½ x 7 in.; 300-hp., twelve-cylinder V-type, 5½ x 7 in., and 450 hp., eighteen-cylinder, 5½ x 7 in., broad arrow type. A model termed 1000 hp. is also in hand, this having twenty-four cylinders set broad arrow fashion in rows of eight. Engines of the 300-hp. and 450-hp. models were used on the British coastal motor boats which came into notoriety during the war on the Dover patrol. They have two carbureters for each row of cylinders—one at each end of a straight manifold; hollow shaft lubrication; magneto and battery ignition; gear type oil and water pumps. Prices are: 35-hp., $1,425; 100-hp., $4,000; 160-hp., $6,650; 300-hp., $12,000; the weights being 250 lb., 590 lb., 900 lb. and 1250 lb. for the sizes in the order named. They are all ungoverned and run at a normal speed of 1200 r.p.m.; electric starting equipments are fitted to all except the two larger models, which have a compressed air starting system.

Parsons.—The post-war program of this well-known firm of marine engine builders has settled on two standard types, differing mainly in respect to bore and stroke. The smaller range is 4½ x 6-in., while the larger is 6½ x 8. Both types are made in two, three, four and six cylinder types, while the smaller is also arranged as a single-cylinder unit. Kerosene is the standard fuel in both; they are engines of medium speed, the smaller bore type running at 850 and the larger at 650. Hollow shaft lubrication, magneto ignition, separate L-head cylinders and eccentric water pumps are used throughout but, while the lighter range has a gear type pump, the heavier has a plunger type.

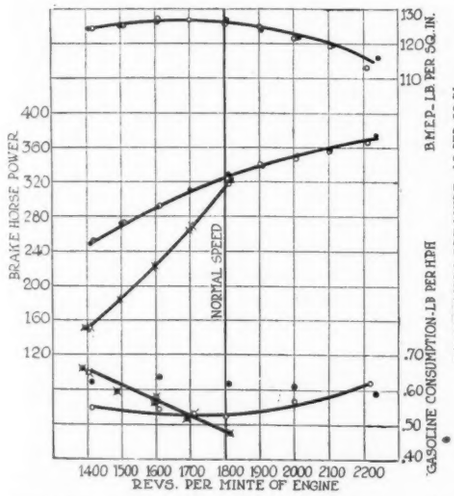
A special feature of these engines is the magneto drive, which passes through two concentric sleeves, the drive being conveyed from helical keyways in one to keys in the other, axial movement of the latter serving to vary the time of firing. In this way the firing spark is always of maximum intensity whether advanced or retarded. It is claimed that there is no necessity for an impulse starter when this arrangement is provided, although on the heavier engines two separate ignitions are fitted, one magneto and the other battery and coil. Arrangements are also made in both types for fitting an electric starter and for a dynamo drive. In regard to prices and weights, the following examples may be given: 21-hp., four-cylinder, 4½ x 6 in., $1,250 engine only, weight 1100 lb.; 60-hp., four-cylinder, 6½ x 8, $2,850, weight 3200 lb. The 7-hp. single-cylinder 4½ x 6 weighs 420 lb., and sells at $650 for engine only or $950 for the complete installation, consisting of engine, reversing gear, shaft and propeller.

Test of Standard Hispano-Suiza Engine

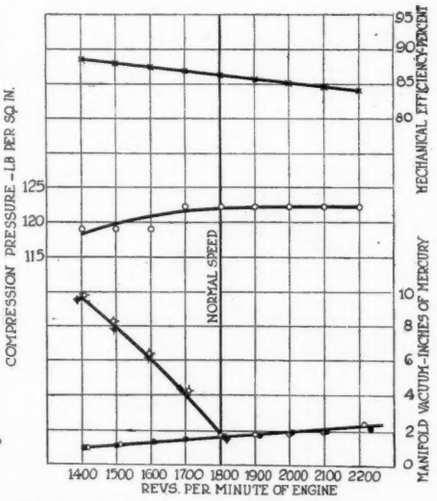
THE engineering department of McCook Field has made a complete test to determine the sea level performance of the standard 300-hp. Hispano-Suiza engine. The particular engine under test was serial No. 13481, which was subsequently sent to the Bureau of Standards for an altitude chamber test. Two runs were made to obtain the data for each full power and propeller load curve, only one run being made for the friction horsepower data. The readings taken and the method of conducting the tests followed the standard method in use at the McCook Field laboratory.

The readings showed a maximum brake horsepower of 362.1 at 2240 r.p.m. The torque in pounds-feet at this horsepower is 866, the maximum torque being 948 lb.-ft. at between 1700 and 1800 r.p.m. The maximum brake mean effective pressure is 126.8 lb. The water entered the jacket at approximately 90 and left at 110 deg. Fahr. The oil pressure averaged 65 lb. per sq. in., and did not vary more than 5 lb. in either direction above or below this point. The temperature of the air at the time of the test was 80 deg. Fahr., and the gasoline consumption was as low as 0.528 lb. per hp. hr. The average barometer during the test was 29.2 in. of mercury.

On the runs for determining compression pressure and frictional horsepower, the maximum frictional horsepower was 67.4 at 2200 r.p.m. This corresponds to a mechanical efficiency at 84.2 per cent, and the compression pressure at this time was 122 lb. per sq. in. The results of the runs are summarized in the curves shown in the illustrations herewith. The mechanical efficiency decreases as the speed increases.


BRAKE HORSE POWER
B.M.E.P.-LB PER SQ.IN.
GASOLINE CONSUMPTION-LB PER H.P.H.
NORMAL SPEED
REVS. PER MINTE OF ENGINE
1400 1500 1600 1700 1800 1900 2000 2100 2200

1—Curves of brake M. E. P. brake horsepower and fuel consumption at sea level for full throttle and propeller load operation of 300-hp. Hispano-Suiza engine


COMPRESSION PRESSURE -LB PER SQ.IN.
MECHANICAL EFFICIENCY-PERCENT
MANIFOLD VACUUM-INCHES OF MERCURY
NORMAL SPEED
REVS. PER MINUTE OF ENGINE
1400 1500 1600 1700 1800 1900 2000 2100 2200

2—Curves of compression pressure, mechanical efficiency and manifold vacuum at full throttle and with propeller load of 300-hp. Hispano-Suiza engine

An All-Weather Top for the Open Passenger Car

The design shown here, which has been carefully worked out by Mr. Mercer, was planned with the idea of enabling the owner to use his open machine in all seasons. It is an adaptation of the California top idea. All parts are accessible and the necessary changes may be made easily.

By George J. Mercer

ALMOST from the beginning, the feasibility of making a touring car an all-weather job has been a debatable question in the minds of both the owner and the manufacturer. Much experimental work has gone on during this time and although none of the resulting cars has been really successful in appearance, many have been satisfactory so far as service is required.

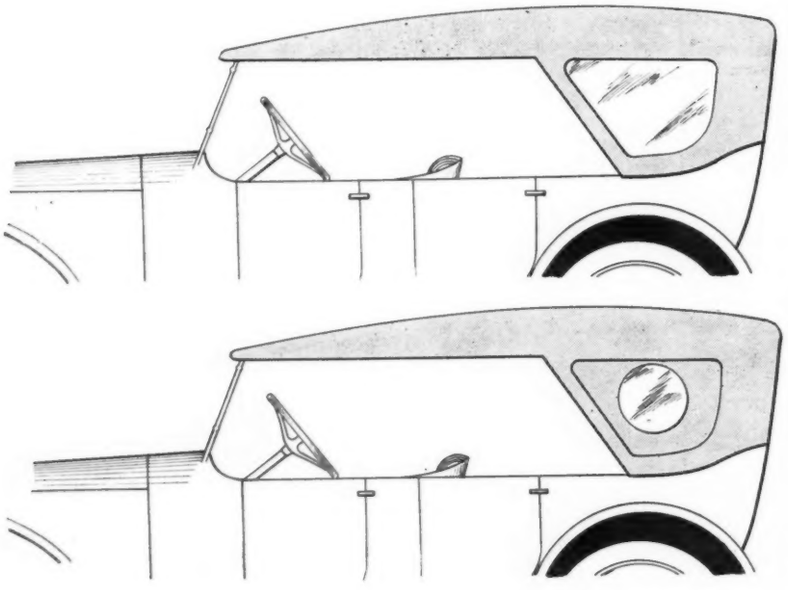
One of the complaints made of this conversion proposition has been the amount of work necessary when making the change from one to the other form, something that really cannot be entirely avoided and it is, no doubt, this same cause that made the demountable top disappear after only a short life. The salutary effect of the competition of the various make-over tops has been the better curtain equipment of the average folding top. Curtains are made with larger lights and placed in position so that they can be adjusted quickly, they are made to fit properly and it is possible to-day to get a fairly comfortable car for use even in extreme weather with a top and curtains as made at the present time.

We are to-day at an entirely new stage of touring top usage. The average user is content to have the top standing during the entire life of the car. It is rare in many localities to see a top folded down and some manufacturers are not supplying envelopes as standard equipment. Also, the top rear rest iron is carried in the tool kit and like the starting crank is to be used only for emergencies.

The condition just cited has made possible the acceptance of the so-called California or stationary top. With this make it is much easier to arrange sides with glass, having more of the actual comfort of the closed body. At the same time it gives the car a finished look and avoids the patched up appearance that the old demountable top always had.

The growth of this top is bound to be of large extent. The large number of car users can have but the one car and this must do service every day in the year. Consequently, it stands to reason that the touring body, which is light, roomy and is suitable for three parts of the year just as it is made, naturally will take on an addition that will add to its appearance as well as to its utility. This may be done without an undue outlay of money and has, besides these other qualities, the one permitting changes with little work.

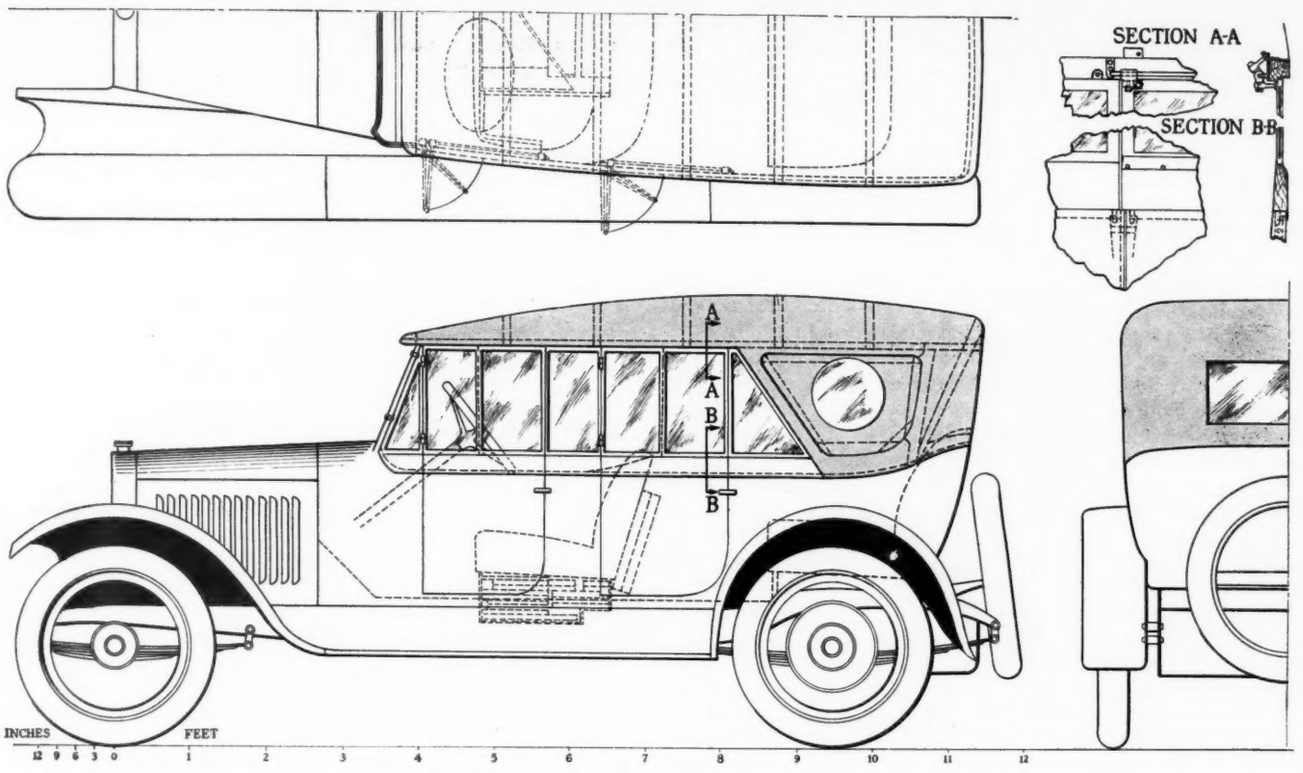
There are several excellent tops of this type on the market and the only reason for presenting the design illustrated here is that it has some different features. It is arranged so that all the parts are always carried in an easily accessible place and, by the arrangement of the construction, ventilation can be obtained in any proportion without dismantling any part. This design may be applied to any body in use and will not require material changes for attachment.



The all-weather top designed by Mr. Mercer

An ordinary five-passenger body has been taken as a model. The wheelbase is short, similar to the conventional small car, this type having been chosen because a car of this size is the pre-eminent car to-day and if the top will look well on a car of such size, it surely will look well on a larger one.

The general shape is different from the conventional in that the rear stationary part is of the victoria shape. The glass between it and the door is triangular and, although the side rear window is circular and not large, there is a section that may be removed to give the maximum of opening. The appearance—with the side glasses out and the circular glass in position and with the latter removed—are shown in sectional views.



Details of the all-weather top drawn to scale

The really novel feature of this top is the form of the door windows. Ordinarily these windows are made to open with the door, in a manner similar to the regulation door curtain rod. We have digressed radically from such a form by having the windows open independently of the door; true, this will necessitate a mechanical operation but it has two advantages, one being that the window can be partly opened at any time and made to form a perfect ventilator and avoid strong wind pressures. The sectional top view will show how this operates. Another advantage is that the assembling is simplified because the attachment on the door is minor, the glass being carried by the rod inside the toprail and the hinges. Both of these are hooked on and do not take time to assemble—that is, the hinges are hooked and the attachment that slides is fastened by a wing bolt.

The sectional views A-A and B-B show the top and bottom of the door window and its form of operation. These views are given as indicated by the arrow marks and are further illustrated by a third angle projection showing the interior of the body at these points. The two views of A-A show the side rod and the slider is shown in three views and two positions, the second position being when it is not in use and is thrown over and fastened to a plate on the top of the toprail, the same wing bolt being used in both cases.

The slider is self-explanatory. As the glass frame is pushed back along the rod as shown in the positions on the top view, the arm from the frame rotates on the perpendicular pin. The position in which the frame is shown at right angles to the body on the top view is the one when the door is opened for entrance or exit, the other position of the frame being simply one of the many that may be had at the discretion of the passenger. More than half of the space of the door opening is obtained and the slant of the frame will tend to ward off direct draft into the interior. Any amount of opening, from the smallest space up to that shown, may be gaged. The travel, as before stated, is guided by the sliding on the rod and the pivot on the hinges. At the bottom, opposite the hinge side, there is no bearing at all, this point swinging free. When closed there is a fence for stop and to prevent the entrance of the rain as indicated at B-B, the fence is a metal strip of the same character as that used on closed cars.

These window glass frames are different from those of the front, middle and rear in that they are not an integral part with the lower or solid section connecting with the top of the body side. On the three mentioned, the glass frame and the lower solid part, which is covered with the top material, are in one and are so assembled on the body. But with the door frames, the difference is that these lower pieces are assembled separately on the top of the door and also are carried separately in the pocket space under the seat.

The manner of fastening to the door top is that used on landau folding door heads. Two pins engage in the top of the door bar. They are held by wedge points that in turn are part of a spring plate, the manner of disengaging being to press a plunger flush with the door face. This explanation substantiates the first statement that the method of assembling is simpler than with the average top now constructed. Also, this same manner of bottom fastening is used on the other frames, and on the interior view of A-A the lug used to fasten the top of the middle frame is shown. It should have been mentioned in connection with the fence on the doors that at the hinge end, part of the fence must be cut away to permit the free end of the glass frame to pass when the door is opened wide.

On this door glass, the point or line where it folds is also hinged. This can be a simple little plate riveted at the extreme top and bottom. The necessary opening between the glass is covered by a plate that laps over as shown, the open side being at the rear to prevent the entrance of rain. Where the frames meet, a rubber strip makes a tight joint.

It is intended to make this job free from complicated mechanical features that will add to expense, and consequently the method of fastening the door glass frame at the bottom is simply a small hook that is thrown off and on before opening. It is feasible, however, to make the door glass proof against opening from the outside by using a small lock.

On the side view illustration dotted lines indicate the glass frames set in the pocket under the front seat. On the top view the frames are likewise outlined and on the back of the front seat of the side view, the dotted lines show the two quarter sections of the rear quarter as they will be carried when not in use. It will be seen that it is practical to carry all the parts to make the body convertible in a compact space easily accessible and it is almost as convenient to put them into place as the regulation curtains. It would not be desirable, however, to put up these sides for an ordinary rain storm. Their use should be reserved for the colder part of the year when the weather is changeable and for severe rain storms; it is desirable, therefore, to carry in the roof curtains that will be more applicable for summer showers.

It might be asked why this top is desirable for general use as against the advantage of a closed body. One answer is that there are a large number of touring car owners who seek to remedy the disadvantage of using an open car in the winter without going to the expense of having two bodies. Another reason is that this top on a touring car is less expensive than a closed body, and also it is the only durable top that can be opened all the way from front to back.

It is durable because it is of light construction. It cannot be repeated too often that the top must be light if the side braces are to be removed when it is remembered that a sudden stop will tend to throw the passengers forward. What a great strain must be put on the pillars when the whole weight of the top is suddenly projected against the front supports. A top made like the one illustrated is simply a skeleton; it is more than amply braced for its weight and the covering is simply fabric; therefore, we have ideal conditions for long service with the component parts as described.

It is the custom to choose the covering for this style of top from some of the waterproof fabrics made up to imitate what is commercially known as Spanish leather. The colors are mottled and generally green is the predominate color. This custom is growing; it seems to make a better looking job than do black goods, and as this form of goods is equally durable with the black, it is to be recommended. It is not intended to specify any particular material, as there are various makes, and for a top that is not to fold, practically any reliable product is suitable.

A top of this kind should be lined, and as the service is hard, a material similar to the outside, but not so heavily bodied, is the best. It can be cleaned easily, will not absorb dust and is sanitary. There is, consequently, no objection to any lining material, but a smooth finished goods will give the best service.

One other feature is the removable section in the rear quarter. It is simply a frame of wood into which the circular glass is set, the whole being covered with the top material, and is fitted tight into the opening. Four plates with screws, one at each corner, will keep it safely in place, and, as mentioned, when not in place, these inserts are carried at the back of the front seat.

The frame forming the windows is commercial channel ¼ in. inside, and in order to have the required depth at top and bottom, flat stock is soldered to the flat side of the channel. It is not assumed that patching up the angle in this way is something to be thought of for production, but the feature of this article is to make a design workable for any small shop. For quantity, it would be better to use bar stock and mill the channel. Commercial channel should be used for the upright members. The metal frames are enameled and the glass is set in with tape. As all the places of contact between the frames are intended to be faced with rubber strips, it is safe to say that there need be no rattle of the parts.

The side view shows the wood framing to make the top, the bows are the same as used for the folding top and are framed to the straight toprail, which in turn ends at the back bow. The wood pieces to form the back part and the rail to fasten on the top of the body are too common to need description. The scale will give the sizes if wanted and the various views are sufficient to determine beforehand if the idea is acceptable. We believe that many owners are able to make a top like this with little outside help, and by starting now and working at spare time, the top could easily be made by the approach of cold weather. For height and shape, the folding top will be the guide. The most troublesome part will be the small triangular glass fitting tight to the windshield. The front part of this may have to be a casting, but that would depend upon the shield itself. The other trouble part will be the slider blocks; these will be a casting also and must be machined.

The Wireless Telephone for Commercial Flight

THE results of several tests with wireless telephones used by airplanes in the London-Paris service were related by Harry Harper, technical secretary of the British Civil Aerial Transport Committee, in a recent issue of the London *Times*. The land station at Lympne, on the English coast, was able to keep in constant spoken communication with the plane throughout its trip to Paris, a distance of some 250 miles, and the station at Hounslow, from which the plane departed at London, heard the pilot until he had gotten as far as Abbeville, France, about 130 miles away.

Mr. Harper failed to describe the apparatus so tested other than that it was an improved type. He listened to several conversations with the plane and found them to be clear and easy to establish. The pilot used his telephone principally for ascertaining weather along his route, particularly demanding of the Lympne station information concerning the conditions over the Channel. He received satisfactory reports, although miles away, and was reassured of his ability to cross.

Frequently an unfavorable weather condition is local and by having information concerning it the pilot may fly around or over the bad spot. The wireless telephone would enable him to keep in constant touch with the ground for ascertaining such spots and, in addition, conversation with the ground stations would enable him to keep his directions, find out his location and otherwise make his journey easier. Considerations such as these show the value and possibilities of the wireless telephone, particularly in its application for commercial flight.

Theories and Practices in the Air Cooling of Engines

Part I

Few subjects are of more interest to the automotive industry to-day than that of air cooling. Consequently, this two-part article is presented as a careful and complete study of many phases of this absorbing topic. The conclusion will be published in the next issue.

By A. H. Gibson, D.Sc.*

THE cooling surfaces of the modern air-cooled cylinder almost invariably take the form of a series of fins. A large number of tests have been made to determine the rate of heat dissipation from such surfaces, with results which show that for wind speeds between 20 and 60 m.p.h. the heat loss is sensibly proportional to the mean temperature-difference between the fin surface and the incoming air, and to the 0·73 power of the wind speed. For a given material the heat dissipation is sensibly independent of the roughness of the surface. Different materials have slightly different dissipation coefficients. A steel surface appears to give somewhat greater heat dissipation than an aluminum or a copper surface, the difference being, however, only about 5 to 10 per cent. The dissipation from cast aluminum fins appears to be improved by a coating of suitable stove enamel, the difference between the enamelled and plain fins being about 10 per cent.

Over the range of cylinder sizes usual in practice, the dissipation coefficient is sensibly independent of the cylinder diameter.

A large number of tests have been made to determine the heat loss from finned cylinders in a parallel air blast, with results which indicate that, for copper fins, this heat loss is given by—

$$\sigma = (0{\cdot}0247 - 0{\cdot}0054\ (l^{0{\cdot}3}/p^{0{\cdot}4}))\,V^{0{\cdot}73}$$

in Centigrade heat units per sq. ft. per min. per degree Centigrade of difference between the mean temperature of the fins and that of the incoming air.

Here l is the length of the fins in inches.
p is the pitch in inches, measured from surface to surface of adjacent fins.
V is the wind speed in miles per hour.

This relationship has been deduced from tests on cylinders having diameters ranging from 1·25 to 3·75 in., with fin lengths ranging from 0·63 in. (16 mm.) to 1·62 in. (41 mm.), and with pitches ranging from 0·1575 in. (4 mm.) to 0·75 in. (19 mm.). Where the fins are of tapering section the value of p should be taken at the mean height of the fin.

Shape and Size of Fins.

The fin which gives the maximum heat-loss per unit of weight is one having slightly concave surfaces and a sharp tip. It may be shown, however, that a plain triangular fin is only very slightly less efficient. The best proportions for such a fin depend on the conductivity of the material and on the wind speed. For a speed of 40 miles per hour, Table I shows the best proportions for such fins of aluminum alloy (conductivity = 0·38 C.G.S. units) and steel (conductivity = 0·10 C.G.S. units) and also for rectangular copper fins (conductivity = 0·90 C.G.S. units).

TABLE I

Bottom Breadth "B," Cm.	0·025	0·05	0·1	0·2	0·3	0·4	0·5
Length, cm.:							
Aluminum	....	....	2·0	2·9	3·5	4·1	4·5
Steel	....	....	1·1	1·5	1·8	2·1	2·3
Copper	1·6	2·3	3·3	4·8	....	....	....

If such a fin be truncated until the tip breadth is one-fifth of the bottom breadth, the lengths become 80 per cent of those given above. The heat dissipation is about 0·88 times and the weight 0·96 times as great as for the complete triangular fin.

Since the heat dissipated from a fin of given shape varies directly as the length of the fin, while the weight varies as the square of the length of the fin, other things being equal, cooling fins should be as short as possible, a large number of short thin fins being used in preference to a smaller number of longer and thicker fins. While in practice this is to be borne in mind, many other factors besides that of weight have an important bearing on the best size of fin to be adopted. Thus, in a thin steel cylinder, or in a cylinder of cast iron or cast aluminum alloy, the circumferential ribs add greatly to the strength and resistance to distortion. Comparatively deep and heavy fins have a greater effect in this direction than a larger number of similar but smaller fins giving the same cooling. Again, as the number of fins is increased, the pitch is correspondingly diminished. This diminution in pitch reduces the air flow between the fins to an extent which may, with very small pitches, render the fins practically useless for cooling purposes.

In a cylinder of cast iron or of aluminum alloy, foundry difficulties put a definite limit to the minimum pitch of the fins. On the barrel itself a somewhat smaller pitch may be adopted than on the head, or the barrel fins may be turned out of the solid if desired. On account of the complicated form of the cylinder head and ports, however, it is impossible to machine their cooling fins, and the length of many of the cores necessitates the pitch being made fairly large. The minimum practical

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Paper read before the Institution of Automobile Engineers of Great Britain. Condensed.

pitch of fin for such cylinders, having a diameter of from 4 in. to 6 in., is about 8 to 9 mm. or about 5/16 in. Foundry difficulties also prevent the casting of a fin having a tip less than about 0·5 mm. in thickness, or a root thickness less than about $l/10$, so that an aluminum fin 1 in. long would not have a root thickness less than 0·1 in.

For steel cylinders with fins turned out of the solid, the pitch may with advantage be cut down to about ¼ in. on a cylinder of 3 in. or so in diameter, but there appears to be little to be gained by reducing the pitch beyond this point.

Variation of Cooling With Density of Air

The cooling intensity of an air blast depends on the weight of air brought into contact with the cooling surfaces in unit time. In the case of an aircraft engine, the density of the air varies considerably with the height. The weight involved in cooling is proportional to ρV, and the heat dissipated from a finned surface is proportional to $(\rho V)^{0.73}$. In the case of an automobile engine, variation in density may, in general, be neglected, except for units designed for operation at high altitudes.

Heat to Cylinder Walls and Piston

The amount of heat transmitted from the working fluid to the walls and piston of an internal combustion engine depends upon a number of factors, including:—

(a) the design of the cylinder,
(b) the strength of the working mixture,
(c) the spark advance,
(d) the compression ratio,
(e) the fuel used,
(f) the speed of rotation,
(g) the size of the cylinder.

The bearing of these various factors will be considered at a later stage.

Since the heat transmission from the fluid to the walls during its most important stage, i. e. during and directly after explosion, is largely due to radiation, and is therefore probably approximately proportional to $(T_g^4 - T_w^4)$ where T_g and T_w are the absolute temperatures of the gas and the walls, any such difference of wall temperature as is likely to exist in practice between an air cooled engine and a water cooled engine can have little effect on the rate of heat transmission. As a matter of fact, such measurements as have been made show that the differences in wall temperature, piston temperature, and exhaust valve temperature, between a well designed air cooled cylinder and the corresponding water cooled cylinder are small, and that unless the water cooling system is well arranged, the air cooled cylinder may be, and often is, actually the cooler of the two.

General Results of Tests

Results of tests on eight water-cooled and two air-cooled engines show that the heat transmitted from the working fluid to the cylinder walls and piston may range from 70 per cent to 150 per cent of the heat equivalent of the brake horsepower, depending on the design and conditions of operation of the engine. Under normal conditions of operation and for speeds below that giving maximum power, the speed of the engine has not a large effect on the heat transmitted per brake horsepower. Usually this diminishes with an increase of speed. In general, the diminution in this ratio with increasing speed is more marked in an engine with comparatively low compression ratio.

Table II shows the temperature attained at a point on the side of the combustion space of an aluminum cylinder 4½-in. bore by 5½-in. stroke, with a compression ratio of 4·7, in a cooling wind of 53·5 m.p.h.

TABLE II

R.P.M.	B.H.P.	Temp., Deg. C.	R.P.M.	B.H.P.	Temp., Deg. C.
800	10·2	100	1400	18·0	123
1000	12·8	103	1600	19·7	136
1200	15·4	124	1800	20·6	138

The temperature of the cooling wind was 22 deg. C. The tests were carried out at full throttle, with fuel and spark adjusted to give maximum load conditions at all speeds. The normal speed of the engine is 1,400 r.p.m., and the result shows that from 1,200 to 1,800 r.p.m. the effect of speed on the cylinder temperature is very small. If the temperature-difference between the air and the cylinder at the given point be taken as a measure of the heat dissipated from the cooling surfaces, it appears that the heat dissipated per b.h.p. is 13 per cent less at 1200 than at 800 r.p.m., and 15 per cent less at 1800 than at 1200 r.p.m.

It appears that the heat transmitted per b.h.p. diminishes appreciably with an increase in the compression ratio. Since, within limits, the brake horsepower increases with the compression ratio, the total heat to the walls does not diminish so rapidly as the ratio of A/B.H.P., and may, indeed, increase with an increase in the compression ratio. Tests on any given engine usually show that there is some fairly definite compression ratio giving a minimum wall temperature, and that for moderate variations of compression ratio on either side of this value, the variation of temperature is small.

This point is brought out by the test figures from an aluminum air cooled cylinder of 100 mm. bore by 140 mm. stroke, under maximum load conditions in a 64 miles per hour wind, given in Table III. Attention is drawn to the figures for fuel consumption and brake mean effective pressure in these tests, as indicating the possibilities of such a cylinder.

Effect of Cylinder Dimensions

The tests available are not sufficiently comprehensive to enable any decisive opinion to be expressed on the effect of a variation in the cylinder dimensions on the heat transmission per b.h.p. A comparison of Fiat and a Sunbeam engine of sensibly the same compression ratio shows that the ratio A/B.H.P. is 10 per cent less in the Fiat engine which has a cylinder diameter 68 per cent greater. The comparison is, however, invalidated by the fact that the speed of the Sunbeam engine is 2,100 r.p.m. as compared with 1,250 r.p.m. of the Fiat. At the same speeds it appears probable that the ratio A/B.H.P. would be about 20 per cent less in the large than in the small cylinder.

If a mean be taken of the values of A/B.H.P. from three engines of substantially the same cylinder diameter and compression ratio, and if this be compared with the value for another engine with the same speed and compression ratio, the result shows a mean diminution of 9

TABLE III

Compression Ratio	Brake Mean Effective Pressure	Fuel, Lb. per B.H.P. per Hour	Mean Temperature of Barrel, Deg. C.		Remarks
			Top	Bottom	
4·6	116·2	0·530	180	105	.....
5·0	119·3	0·507	170	95	.....
5·4	122·0	0·490	157	89	.....
5·8	125·0	0·475	154	85	.....
6·2	129·0	0·480	183	110	Occasional pinking.
6·4	123·0	0·520	212	135	Heavy pinking.

per cent in A/B.H.P. corresponding to an increase of 33 per cent in cylinder diameter. This question requires much further experimental investigation, but as a temporary working assumption based on these and other results, it may be taken that over the range of normal cylinder size each 10 per cent increase in cylinder diameter in engines of similar design diminishes the heat-loss to the walls per b.h.p. by about 3·5 per cent.

Since, however, in similar air cooled cylinders at the same speed of rotation, the horsepower is approximately proportional to the cube of the linear dimensions, the ratio of cooling area to heat given to the walls increases as the cylinder diameter is reduced. Taking into account the greater heat transmission per b.h.p. as the cylinder size is reduced, it may be taken as approximately true for similar cylinders and for moderate ranges of diameter that the temperature difference between an air cooled cylinder and the cooling air, in a given wind is inversely proportional to $D^{0.6}$.

Design

The influence of design is shown by a comparison of two engines of I-head and L-head construction respectively. Making this approximate allowance for the difference in cylinder diameter, the L-head cylinder transmits approximately 18 per cent more heat per b.h.p. to the walls than does the overhead valve cylinder. In this L-head cylinder the design is probably as clean as can be obtained with such a type of cylinder. In another L-head engine of smaller size, the exposed combustion space area per unit of cylinder capacity is approximately 25 per cent greater than in the L-head engine of the above comparison, while the ratio of A/B.H.P., when approximately corrected for differences in the cylinder sizes, is 20 per cent greater than in that engine.

Strength of the Working Mixture

This has a very appreciable effect on the heat transmitted to the cylinder walls. The hottest cylinder is obtained with the weakest mixture capable of maintaining maximum load. This is roughly a 13.5 to 1 air/fuel mixture. Any weakening of this mixture not only reduces the brake horsepower, but also the heat-loss per b.h.p., and so in a double degree tends to give a cooler cylinder. At the same time it gives an appreciably hotter exhaust, and so tends to cause overheating of the exhaust valves.

These points are well brought out by the figures in Table IV which are taken from tests on an air cooled aluminum cylinder 100 mm. bore by 140 mm. stroke.

Each pair of tests was run at full throttle under identical conditions except that the fuel supply in 1 and 3 was adjusted to the weakest maximum load mixture, while in 2 and 4 it was still further reduced so as to give approximately the maximum thermal efficiency on the brake horsepower.

The figures of exhaust valve temperatures in Table V. taken from tests on a similar cylinder, with a compression ratio of 5·5, show that the maximum temperature is attained with an air/fuel ratio of about 15·0:1 and a consumption of 0·490 lb. per b.h.p. per hour, whereas the maximum wall temperature is obtained with an air/fuel ratio of about 1·35.

TABLE IV

Test	R.P.M.	B.H.P.	Fuel, Lb. per B.H.P. per Hour	Air/Fuel Ratio	Heat Balance Expressed as H.P.			
					Unburnt Fuel	B.H.P.	Exhaust	From Surface of Cylinder and Crank Case, Etc.
1	1800	16·2	0·544	13·6	7·80	16·2	20·3	18·3
2	1800	15·1	0·516	14·9	1·64	15·1	23·3	16·0
3	2000	16·1	0·535	14·0	6·07	16·1	22·0	17·2
4	2000	15·3	0·523	15·0	1·00	15·3	26·1	15·8

TABLE V

Fuel, Lb. per B.H.P. per Hour	Brake Mean Effective Pressure	Air/Fuel Ratio	Exhaust Valve Temperature, Deg. C
0·622	122	11·1	706
0·589	122	11·9	717
0·515	119	13·8	747
0·480	116	15·2	752
0·470	114	15·7	747

A further increase in mixture strength beyond that necessary to give full power reduces the temperature of the cylinder surfaces. In this case combustion is very incomplete, the maximum temperature of combustion is diminished, while the evaporation of the unvaporised fuel entering the cylinder is a secondary reason for the reduction of the temperature obtained. This point is well shown by the figures in Table VI, which show the temperatures at the same point, near the center of the head of an aluminium air cooled cylinder with overhead valves. The engine was operating at full throttle throughout at 1400 r.p.m. The only variable in the tests was the fuel supply to the carbureter. The air temperature was 23 deg. C.

TABLE VI

Test	B.H.P.	Fuel, Lb. per B.H.P. per Hour	Air/Fuel Ratio	Temperature of Cylinder Head, Deg. C.
1	32·8	0·70	10·5	200
2	33·2	0·64	11·4	215
3	33·3	0·57	12·9	237
4	32·9	0·54	13·5	229
5	30·6	0·51	15·4	215

Ignition Timing

The timing of the ignition may have a pronounced effect on the maximum temperatures obtained, and on the heat dissipated to the walls, mainly because it largely governs the type of combustion. This effect is well shown by the figures in Table VII taken from tests on an aluminum-headed air cooled cylinder, 5½ in. bore by 6½ in. stroke. In these tests the only variable was the spark advance. The figures show the cylinder wall temperatures at the center of the combustion head, in an 80 m.p.h. cooling wind, at 1,450 r.p.m.

The figures show that so long as the spark advance is not so great as to produce pinking, it has comparatively little effect on the wall temperatures. Once pinking is set up, the temperature shows a very appreciable rise.

Fuels

The amount of heat transmitted to the cylinder walls varies somewhat with the composition of the fuel. The author has no evidence to show how it varies with the quality of the fuel, where this is used. A number of tests have, however, been made with gasoline-benzol mixtures, with results that show that:—

(a) The heat transmitted to the walls per b.h.p. is somewhat less with a 20 per cent benzol mixture than with standard gasoline.
(b) The difference increases with the compression ratio.
(c) The difference increases with the engine speed.

In the case of the single-cylinder Mercedes engine the difference was:—

1·0 per cent with a compression ratio of 4·0
2·0 per cent with a compression ratio of 5·0
3·0 per cent with a compression ratio of 6·0

at a speed of 1400 r.p.m.

As the power developed under normal conditions is about 5 per cent greater with a 20 per cent benzol mixture than with gasoline, the total heat transmitted to the walls is sensibly the same whichever fuel is used.

This is borne out by the results of tests on an aluminum air cooled cylinder, tested with Shell A gasoline and with a mixture of Shell A and 25 per cent benzol. In this case,

TABLE VII

B.H.P.	Fuel, Lb. per B.H.P. per Hour	Spark Advance, Deg.	Temperature, Deg. C.	Remarks
30·5	0·515	21	215	.....
31·2	0·498	26	215	.....
31·6	0·492	30	221	.....
31·6	0·492	36	245	Occasional pinking.
31·0	0·500	40	275	Continuous heavy pinking.

the compression ratio was 5·0. At the same speeds the benzol mixture gave 5·3 per cent more power with a 2½ per cent increase in consumption by weight. The maximum cylinder temperatures were, nevertheless, sensibly identical, the difference being less than 5 deg. C. The difference is, however, very marked where, owing to insufficient cooling or a very high compression ratio, severe pinking or detonation is caused when working on gasoline. The temperature of spontaneous ignition of a gasoline benzol mixture is appreciably higher than that of gasoline, and under circumstances in which detonation is severe and overheating occurs with gasoline, it is possible to obtain normal operation with normal temperatures if a benzol mixture is used.

Working Temperatures

Experiment shows that the maximum temperature of the head of an air cooled cylinder should not exceed about 270 deg. C. for satisfactory working. With maximum temperatures of 200 deg. to 220 deg. C. results, both as regards fuel consumption and brake mean effective pressure, can be obtained which are quite as good as those from a water cooled engine of similar design and size. If the temperature exceeds about 280 deg. C., trouble is usually experienced through preignition, and plug trouble becomes apparent, but this is much more marked on some cylinders than others. Generally speaking, the larger the cylinder, the higher the permissible working temperature. The temperature of the exhaust valve at its hottest point should not exceed about 720 deg. C. In the case of valves not exceeding 1·5 in. in diameter, it is quite possible to keep down this temperature, under favorable conditions, to 650 deg. C.

In a well designed aluminum cylinder of the overhead valve type operating in a 60 m.p.h. wind, experience shows that a provision of from 0·28 to 0·35 sq. ft. of cooling surface per b.h.p. is adequate to give the required temperatures under normal conditions of operation, the larger area applying to cylinders of about 4 in. bore, and the smaller to cylinders of about 6 in bore. For steel or cast iron cylinders with overhead valves, this area should be increased by about 50 per cent, and for L-head cast iron cylinders by 100 per cent.

Tests with reduced wind speeds show that with a cylinder designed for a given air speed, the temperature increases and the power is diminished as the wind speed is reduced. Also the fuel consumption at maximum load is increased. Experiment shows that the difference of temperature between the hottest point of the cylinder head and the cooling air, under such circumstances, is approximately inversely proportional to $V^{0.4}$. Thus in a given series of tests a reduction in wind speed from 80 to 40 m.h.p. increased the cylinder temperature from 229 to 296 deg. C., the air temperature being 23 deg. C. The brake mean effective pressure dropped from 116 to 106 lb. per sq. in., and the fuel consumption rose from 0·549 to 0·597 lb. per b.h.p. per hour.

Since the heat dissipation is proportional to the area of the cooling surface if this is equally efficient, and to the 0·73 power of the air velocity, the cooling area per horsepower for a given cylinder temperature should be inversely proportional to $V^{0.73}$. Thus a cylinder designed for a 60 m.p.h. cooling blast will maintain the same temperature in a 30 mile wind, if the cooling surface be made $2^{0.73}$ (=1·66) times as great.

There are, however, practical difficulties in the way of increasing the cooling area beyond a certain limit, and experience tends to show that a well-designed aluminum air-cooled cylinder of overhead valve type, and of 4-in. diameter, cannot be designed to give its maximum output on a really low fuel consumption in a wind of less velocity than about 50 m.p.h.

With smaller diameters the necessary wind velocity for the same wall temperatures is less, the necessary velocity being approximately proportional to $D'^{0.6}=D^{0.82}$.

Table VIII shows then the minimum air velocity necessary for first-class performance of air-cooled cylinders of good design and material, under normal full throttle conditions.

TABLE VIII

Diameter, In.	Velocity, M.P.H.	Diameter, In.	Velocity, M.P.H.
2	30	6	70
3	40	8	90
4	50		

It is true that cylinders may be successfully operated on considerably lower air speeds, but only with reduced output and on appreciably higher fuel consumptions.

An interesting example may be quoted of an aluminum cylinder in which, after testing, alternate fins were first removed. The cylinder was re-tested, after which the whole of the fins were removed and the cylinder was again tested. The diameter and stroke were 4¾ in. by 5½ in. and the speed 1800 r.p.m. The results are given in Table IX.

TABLE IX

Cooling area, sq. ft., including barrel	2.0	4.2	7.0	.....
Temperature of cylinder head, deg. C.	360	270	220	70 miles per hour wind.
	....	320	260	45 miles per hour wind.
Brake mean effective pressures	99	108	115	70 miles per hour wind.
	....	102	109	45 miles per hour wind.
Petrol, lb. per b.h.p. per hour	0.68	0.62	0.56	70 miles per hour wind.
	....	0.65	0.61	45 miles per hour wind.

For cast iron L-head cylinders the maximum air blast should be increased by at least 50 per cent.

Temperatures at Part Load

So far, the temperatures mentioned have all referred to continuous operation under full throttle. Under the normal operating conditions in automobile work this will seldom be necessary, and it is of interest to note how the working temperatures vary on the throttle. Table XI shows the results of such tests on a 150 hp. twelve-cylinder cast iron R.A.F. 4A air-cooled engine at 1600 r.p.m.

Cylinder Materials

With cylinders of normal design, the middle portion of the head is the hottest point. The difficulty of keeping it satisfactorily cool is mainly due to the fact that the free air flow is impeded by the inlet and exhaust valve ports and valve gear, and that owing to the presence of these

TABLE X

B.H.P.	Fuel, Lb. per B.H.P. per Hour	Cylinder Head Temperature, Deg. C. Above Air
146.8	0.560	241
123.8	0.555	221
108.9	0.573	205
89.0	0.585	174

ports it is almost impossible to provide adequate cooling surface at this point. This results in the heat having to travel outward, to be dissipated mainly from the cooling surface surrounding the combustion head. For a cylinder of given design, it follows that the best material to use, with a view to getting this heat away, is that of highest thermal conductivity. Of the three practical materials for cylinder construction, namely, steel, cast iron and aluminum, the latter has much the highest conductivity.

Aluminum Alloys

Aluminum for cylinder work is used in the form of a copper-aluminum alloy. Table XI gives a list of alloys which have been tested.

TABLE XI

Designation	Composition—Per Cent						
	CU.	Sn.	Mg.	Zn.	Al.	Ni.	Mn.
B4	7.0	1.0	.....	1.0	91.0	.....	.....
B12	12.0	.....	1.5	.....	86.5	.....	.....
B17	14.0	.....	.....	.....	85.0	.....	1.0
B18	8.0	1.5	.....	.....	89.5	.....	1.0
B19	8.0	.....	.....	.....	91.0	.....	1.0
B25	9.0	.....	.....	.....	89.0	2.0	.....
B28	4.0	.....	1.5	.....	92.5	2.0	.....
L8	12.0	.....	.....	.....	88.0	.....	.....
L11	7.0	1.0	.....	.....	92.0	.....	.....

The high zinc alloys, which are suitable for crank cases and parts not subject to high pressures and temperatures, have also been tested, but are found to be most unsuitable for cylinder work, since their tensile strength is very low at temperatures exceeding 200 deg. C. The tensile strengths of typical sand castings from these alloys are shown in Table XII.

With the exception of the alloys containing manganese, all have approximately the same thermal conductivity (about 0·38 in C.G.S. units). The addition of 10 per cent manganese as in B17 reduces the conductivity to about 0·27, but this can be increased to a value approximately the same as that of the other alloy by annealing at about 450 deg. C. for a few hours. The relatively high conductivity of these alloys (0·38 as compared with about 0·12 for steel, or 0·10 for cast iron) combined with their low specific gravity (about 3·1 as compared with 7·8 for steel) renders them specially valuable for pistons and for the cylinder head castings of air-cooled engines. The light weight enables a piston crown or a cylinder head to be made of comparatively generous thickness without being unduly heavy, and this, combined with the high conductivity, greatly facilitates the transference of heat from the hottest parts to the cooling surfaces.

TABLE XII

Alloy	Tons Per Sq. In.	
	At 250 Deg. C.	At 350 Deg. C.
L11	5.5	3.0
L8	10.5	6.0
B17	9.5	6.5
B28	11.0	5.0
B25	8.5	4.5

All the aluminum alloys suffer from the drawback that they "grow" in volume on prolonged heating at the temperatures attained in operation. This "growth" is quite apart from distortion or thermal expansion, and in the case of a piston or cylinder head continues for the first 20 to 30 hours of operation, after which it apparently ceases. There is, as yet, insufficient evidence to show which alloys have the minimum "growth," though there is evidence that the presence of zinc as a constituent increases the "growth." In the case of a piston, the "growth" is not in itself sufficiently great to be practically important, and does not in general exceed 1 part in 1000 on the diameter. Where "growth" and distortion take place in the same direction the net increase may, however, amount to as much as 1 in 250.

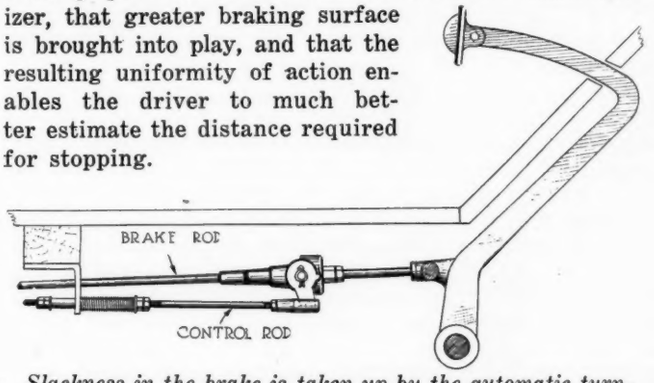
Experiment shows, however, that the "growth" in a piston or cylinder head may be forced by a preliminary period of annealing at a temperature of about 400 deg. C. for 5 hours, and as this also eliminates distortion, if it is carried out before the final machining, no further trouble is experienced in operation.

Automatic Brake Adjuster

An automatic brake adjuster, as illustrated herewith, is undoubtedly an entirely new device in the parts and accessories field. To apply the adjuster the brake rod is cut, or made in two parts, each part being threaded to fit the device. The control rod is set in about the position indicated. The adjuster is a product of the Auto Brake Adjuster Co.

Upon application of the brakes, the adjuster mechanism moves forward, with the exception of the lower portion, which is held by the guide clip through which the rods pass. This relative movement of the different parts causes the small crank of the adjuster to turn through a certain angle, which becomes greater as the brakes wear, whereupon a ratchet inside the mechanism moves to another tooth on a ratchet wheel. When the pedal is released, the adjusting sleeve is turned automatically by the ratchet and takes up the slack.

It is claimed for this device that it gives an equal brake grip on both sides of the car without a brake equalizer, that greater braking surface is brought into play, and that the resulting uniformity of action enables the driver to much better estimate the distance required for stopping.



Slackness in the brake is taken up by the automatic turning of the sleeve on the brake rod

The Hazards and Dangers of the Small Hand Tool

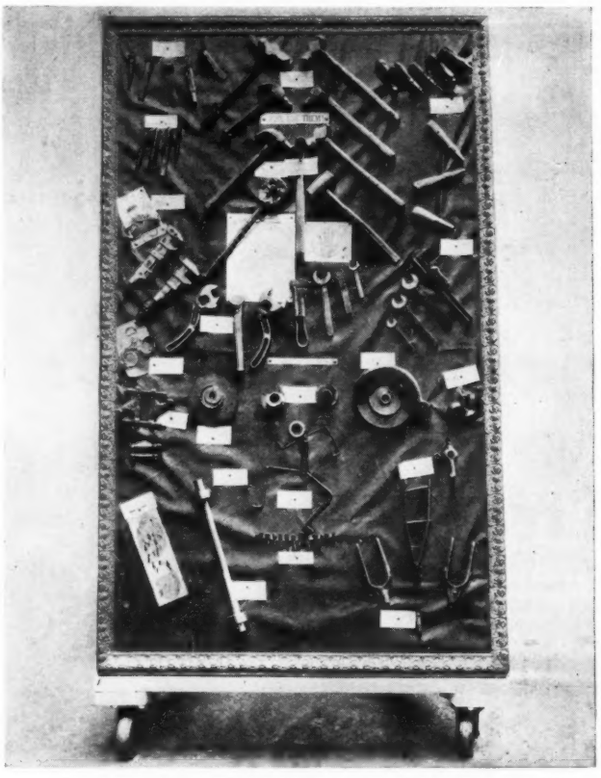
The hammer or wrench that a worker has used for years often is like an old shoe—he hates to part with it. But it may be dangerous. This article shows why and what should be done to eliminate accidents from such causes, thus increasing production and cutting down the labor turnover.

By C. A. Briggs*

ONE of the big leaguers in the safety game says: "Two-thirds of the industrial accidents can be conquered by things not made of wood or metal or that money can buy." He means, of course, that a majority of accidents can be avoided by telling the workman how to do his work in the right way and by placing in his hands the tools that will not fail him while he is doing the job. This is called "Safety Education." We have tried out this man-to-man method of teaching safety and it gets across big.

Taking for example a common lowly hazard, that of defective hand tools, we have a little disturber there that every shop has to contend with and one that has had little thought directed toward it. A few years ago we found, while stressing our accident prevention work over a few departments having a known hazard, that we were paying out thousands of dollars and getting lost time running into the years from an entirely different source, the small tool hazard having been overlooked.

This fact caused us to make a careful study of small tools and their relation to accidents. We found that a major part of the injuries reported from these sources could be grouped under a few main causes, arranged as to accident frequency as follows:



The board that was used to demonstrate the dangers of defective tools and the safety of good ones. It was a silent teacher that had unusual but beneficial results

Tools Slipping—From the heads of bolts, nuts or screws.

Hammers—Striking his own or his fellow workmen's hands, due to glancing or misdirected blows.

Flying Objects—Of all kinds, due to glancing or misdirected blows of hammers.

Chipping—Flying chips from chipping or cutting by use of simple tools.

Having segregated these causes, we planned a campaign to cover every department reporting injuries due to one of the above classifications. The corrective methods we employed to counteract this big loss of man power to production and the consequent depressing effect on the morale of our employees was varied according to the situation, of course, but the fact that at the close of the year we were able to show a decrease of 50 per cent in the number of cases and lost time is evidence that some of our varied plans carried out.

Our approach to the men was through the foremen who gave us a very cordial invitation and personally guided us among their men, making arrangements for them to have the tools redressed or replaced as conditions provoked. We were usually in possession of a real concrete case of an injury in the department under survey where a man had been injured by a defective tool, a flying chip from a hammer, the failure of a wrench that allowed its worn, loose jaws to slip and cast its owner to the floor below or a mushroomed chisel handle that was driven into the hand that held it. These cases and dozens more could be vividly pictured as the men themselves furnished the data in the tools they passed up for criticism.

One of the most innocent little offenders we encountered and usually confiscated was the center punches, screw drivers and drift pins that the men had made by the exercise of considerable ability, from worn-out "rat tail files" and other types without drawing the temper. Some of these were artistically finished but

*Safety engineer of the Willys-Overland Co.

they had, nevertheless, the quality of putting an "artistic finish" to the man who stood near when these same punches were hit and steel met steel. They were too highly tempered to use in such a manner. A demonstration usually proved that they were too peppery for safe use and, when struck, had a tendency to give off particles that went no man knoweth whither, skyward or eyeward.

These little talks to the men, informally, as we passed from bench to bench, proved effective and on the next trip through, the men, instead of slyly slipping their hammer, chisels or punches under the bench out of sight, commenced to array them in plain view of the inspector and take an honest pride in his nicely dressed outfit. The foreman said that new men, as they entered the department, caught this spirit. He said he had really noticed an increase in the output since the men had commenced to use dressed-up tools and there was not much spoilage and fewer trips to the first-aid hospital for an "eye opener" or finger dressings.

Taking up the sub-headings in their order, we will note some of the methods used to correct the particular hazard.

Tools Slipping—We found here that employees were using wrenches that had long ago earned their release from active service and their retirement on a pension. Some of these bore the earmarks of being cheap "mail order" wrenches. Some were plow wrenches, stove wrenches, and some were wrenches that defied classification. They were used as hammers with the result that jaws were sprung, battered and refused to function. We secured the aid of the foreman in collecting all the defective ones and exchanging them for good tools. Then we tried to standardize on machine wrenches for machine men, pipe wrenches for pipe men and we discouraged the use, or rather the abuse, of wrenches where a hammer should be used.

Hammers.—Under this heading we found some interesting things. Among them was the fact that scattered through our plant was a sample of every kind of hammer made and in all conditions of repair. Some were made up of pieces of stock that had a "hammer face," but which was never adapted for the purpose and there was also a tendency to employ them out of their particular realm; that is, machine hammers were used for nailing boxes, claw hammers were found on machine duty and some hammers, if we were to identify them at all, would have to be tagged, "This is a hammer." We were reminded of the shop bulletin reading, "Bury your hammer and buy a horn" and we wished the possessors of some of those tools would take the first part of that motto literally and forget about the horn.

It was surmised that the reason for so many injuries from glancing and misdirected blows of hammers was that many were not balanced, the handles were slivered and wired or too short and large chips were broken out of the head. Some of the hammers were dressed up on a grinding wheel and new handles supplied so this condition showed an improvement.

Flying Objects.—Here we discovered that some of the most severe injuries came from flying nails. These accidents were traced to the shipping departments where we found that the hammers in use were of a type that had a smooth and slightly convexed head; the nails used were coated with a wax-like substance, and this combination frequently sent nails spinning across the room with the resultant injuries. We took one of these hammers and had the head scored or corrugated on a milling machine as an experiment. So successful was the result that we decided to purchase enough to standardize on such a type in the departments where a finished nailing surface was not required. Employees using these corrugated hammers say they can drive a nail easier and that the nails will not fly when hit.

Chipping.—We endeavored here to arrange the men who worked permanently on this job in such a position that the chips woud fly toward a wall or screen, not endangering fellow workmen. In other instances a comfortable pair of goggles solved the difficulty. A word of caution to the chipper will often prevent those distressing and severe accidents that seem to involve a vital spot, the eye.

These were some of the most effective physical corrections brought forth to reduce the injuries from small hand tools, but another method of propaganda was used with such marked results that its use must also be recommended. The defective tools collected from our inspections were grouped on a large framed board having an imitation russet leather background. A card was displayed, typed with the lost time charged to each group of defective tools. Alongside of the defective tools were shown the good ones furnished from the stock rooms. In the center was a letter from the superintendent asking the men to examine their tools and if found defective to have them exchanged. In the lower center a figure of a man was outlined, by using safety set screws and wrenches. He is supposed to be doing a "Jazz" over the heads of some old style set screws and a card reads: "Get above dangerous set screws. Use safe ones and be happy."

This traveling board went the rounds of each department and seldom failed to attract a crowd. Men were known to go back to their benches and clean house on their old, defective tools. It is significant that while this was going through upward of seventy-five departments nothing was ever disturbed maliciously. It was a silent preacher of safety, getting the message across better than some human exponents who were gifted with much speech.

In summing up the advantages of an inspection or educational effort for the reduction of small tool accidents, we find that the largest item would probably be the relief from serious injuries, but there are other by-products that contribute largely toward making it a worth-while effort. Keeping the man on the job in a day when labor turnover is worrying the production man, doing better work with tools that have been placed in proper condition, getting longer service from these same tools that have been reclaimed, and working up a higher morale in the departments where these forces are operative, are a few of the results of the safety campaign. These must be counted as by-products and they constitute a convincing argument for a closer check on the small tools that perform so large a part in the work of our industries.

Cable Exchange Becoming Popular

EUROPEAN advices indicate that more and more the cable is being used for the transfer of money payments between that continent and America. In both France and England, it was said, importers are endeavoring to obtain the most favorable rates of exchange possible and consequently, instead of mailing their transfers with a consequent loss of some two weeks, they wait until a few days before the payment is due and then arrange with their bankers for a cable exchange. It was also said that exporters use this means for obtaining the immediate use of funds due from foreign sources.

The Development of Factory Personnel in the Small Town

A typical Vermont city of 7000 inhabitants, in which several firms specialize in automotive products, has been taken as a concrete example of the industrial possibilities of such a community. Labor turnover has been reduced to a small percentage and other interesting results accomplished.

By Norman G. Shidle

THE advantages and disadvantages of a small town as a manufacturing and industrial center as compared to a large city have been argued frequently and exhaustively. It is evident, however, that certain things are possible in the small town but impossible in the city, and *vice versa*. Especially in regard to personnel problems are conditions different. Whether the large city or the small town offers the best opportunities for making men contented and satisfied cannot be determined in an offhand way. Undoubtedly the small town manufacturer has done some things which city managements might well investigate, and, while certain desirable small town methods cannot be transplanted bodily to a city plant, they may offer suggestions for development in the policies of other firms.

To bring out clearly some of the ideas successfully worked out in a small town, a specific village may be taken as an example. Perhaps these ideas are universally applicable, perhaps not. They do represent, however, successful personnel practice in one place, and for that reason are worthy of serious consideration.

The town of 7000 inhabitants, which is to be used as the illustration of successful small town practice, is situated among the hills of Vermont. It is six miles from the nearest railroad, being connected with the main transportation system only by an electric line that hauls all of the freight as well as the passengers. The population has increased considerably since the war, but manufacturing of importance has been going on there since about 1889. The village supports a first-class hotel, a weekly newspaper, a good supply of churches, and a candidate for governor. So much for the town in general. It is simply a typical New England manufacturing town, except perhaps for a few exceptional ideas and progressive policies.

There are nine manufacturing establishments, the most important being four machine tool firms, each of which is intimately connected with the automotive industry. The origin and development of these four firms is of interest, not especially because of the firms themselves but because their growth illustrates the first Springfield characteristic —opportunity for individual development.

The oldest plant is the Jones & Lamson Machine Co., which is a direct lineal descendant of the old Kendall & Lawrence gun shop, which started at Windsor, Vt., about 1838. The Jones & Lamson plant came to Springfield in 1889 and began manufacturing the flat turret lathe, which had been invented by its young superintendent, James Hartness, now president of the company. Eleven years later came the first important manifestation of the spirit of fostering individual development. The Fellows Gear Shaper was invented and perfected by E. R. Fellows, then chief draftsman of the Jones & Lamson Machine Co. The parent firm, instead of taking over the new invention, as is usually done, aided the inventor to establish the second Springfield machine tool plant, the result of which is the Fellows Gear Shaper Co.

In a similar manner, the Byrant Chucking Grinders Co. grew out of the Jones & Lamson plant and was sent on its way toward individual manufacture and development. More recently, the Lovejoy Tool Works had been established, an outgrowth of an idea conceived by a J. & L employee and developed in a manner exactly similar to the other two.

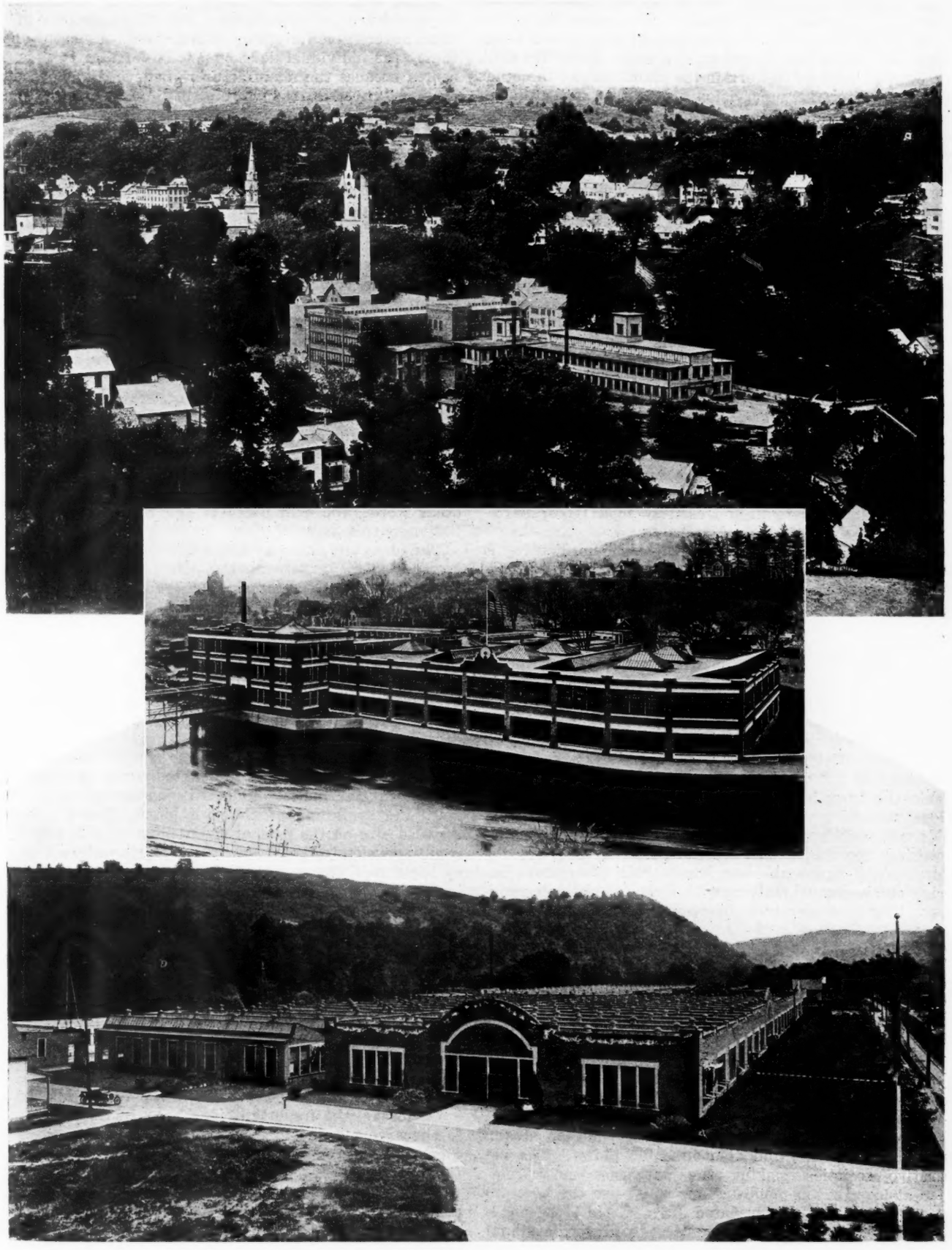
This illustrates, as previously stated, the first Springfield characteristic. It is based on the idea that the best industrial development, both of the individual plant and the community, is achieved through the highest development of individual ambition and personality. The idea is carried throughout the plants. Men are encouraged to learn as much as possible about the machine they are helping to manufacture. All cannot, of course, invent something and then establish their own plant, but all can develop to the limit of their abilities and ambition. Machine-like men are not considered the most effective productive agents and a definite attempt is made rather successfully to develop the individuality of each man. As these new firms were helped to go forward in individual development, so every workman knows, from the facts before him, that he can develop as far as his personal limitations permit.

In considering the factors enabling this plan to work out successfully, the size of the plants must be noted. The Jones & Lamson organization comprises 600 men, the Fellows Gear Shaper about 800, the Bryant company about 175, and the newly organized Lovejoy Tool Co. about 50.

The individual development idea is probably best expressed by a quotation from the "Hartness Flat Turret Lathe Manual—A Handbook for Operators." It reads:

> "A good workman loses his chance for progress if he continues to stick in one class of work after the progress of machinery has taken away the need of his skill. . . . Each one should try to conform to the new order of things. We must not only fit into the world as it is, but we should try to get in line with the drift of things in order to find a good place in the world to-morrow, next month, next year. . . . The greater intricacy of the later machinery gives every one a chance to go ahead to the full measure of his mental capacity and energy."

Another manifestation of this development is the cooperative course in which high-school students, mechan-



Top—General view of central portion of the town. Beginning at the left with the building beside the tall smoke stack, the structures in the foreground are: The upper shop of the Jones & Lamson Machine Co in which the automatic dies are made; the small Lovejoy Tool Co. and the community club house. Insert —Plant of the Fellows Gear Shaper Co. Bottom—The main Jones & Lamson plant

ically inclined, may work two weeks in school and two weeks in the manufacturing plants. The course lasts about three and a half years, the first half of high school being spent entirely in the classroom. In the co-operative plan, the boys actually go to work in the plants among the other workmen under the supervision of the foremen, although the instructor is present in the plant as well. When they have finished the course, they have an excellent practical idea of machine tool manufacture. It is an interesting fact, too, that 90 per cent of the boys so educated either go to work in the Springfield plants immediately upon graduation or return there to work after having pursued further courses of study in institutions of higher learning. During the first year and a half the boys are paid 20 cents an hour for their work in the plants. The next year they receive 25 cents, and the last year 32 cents an hour. At the completion of the course, they receive a bonus of $180, and are considered full-fledged mechanics, being paid the wages of a skilled machinist.

The individual growth of these separate plants also illustrates a second Springfield characteristic, a belief in the small industrial unit as the most effective for personnel and manufacturing development. The difficulties of keeping the management of a large corporation in touch with the workers are too well known to bear repetition here. In this town such feeling was so strong that the opportunity of making one big corporation was entirely laid aside and the four small and entirely separate organizations developed instead.

The third characteristic, specialized manufacture, is shown in the same way. Not only are small plants considered necessary and effective from the standpoint of personnel relationships but also from the manufacturing side.

Each plant specializes in its own particular line, developing its plans and organization with that specialized product in view. Thus, it is believed here, the best and most effective quantity and quality production is secured.

Although no particular Irish sympathies appear in the town, the fourth characteristic is a dislike in common with the people of Erin—the absentee owner is frowned upon. The stock of the four companies is held almost entirely within the town by men personally interested in the development and progress of the industries. Such stockholders, it is felt, are able to see many phases of the manufacturing process besides immediate profits. Thus the managements are enabled to handle both their manufacturing and personnel matters with a view to ultimate progress rather than merely to immediate profits.

Along with these four characteristics is another which is considered of importance. The managements of the firms never "give" anything to their men. Even the opportunity for individual development is not a gift; it is presented because the manufacturers believe that it produces the most effective results from their standpoint as well as from that of the men. In some of the plants men receive a 10 per cent weekly bonus on their earnings when they have not been late or absent during the 48-hour week. This is given on the theory that a man who is prompt and regular to this extent is worth 10 per cent or more to the company's production. The yearly service bonus rests on a like basis. The man who gives continuous service over a period of years is worth more than the man who stays only a short time.

Even the community club, financed originally by the manufacturers of the town and now open to everyone in the community, is self-supporting. It has over a thousand members, all of whom pay dues. The men pay $9 a year, while the women pay $5.

While the manufacturers have provided a staff for operating the clubhouse, the administration of its affairs is entirely in the hands of its members, who elect their officers and appoint the chairmen of the various committees. Moreover, the men elected and thus appointed are not officials of the various manufacturing establishments, but usually are men working in some minor capacity. In other words, the men not only run the Community Club but support it as well.

The ideas and characteristics of a small town which successfully meets its personnel problems are presented chiefly as being suggestive material for thought and adaptation. Some of them are distinctly different from and even opposed to the ideas and characteristics of city manufacturers in the automotive industry. Perhaps some of these small town ideas can be adapted advantageously to large town practice, perhaps they cannot. Certainly, the fact that the average labor turnover in these four plants is about 3½ per cent a month makes the methods used worth serious consideration.

One reason for success in meeting the personnel problem in the town described is undoubtedly that a spirit and policy of utter honesty and fair-play has prevailed ever since the beginning of the first plant. There has been a real desire on the part of the management to help their men to develop to the advantage of the man himself as well as the firm. The opportunity for development is present in fact as well in house organs; this one fundamental can be successfully applied anywhere.

Subventions of Farm Tractors in France

PREVIOUS to July, 1919, the French Government paid a subvention or bonus to purchasers of farm tractors, amounting to 33⅓ per cent in the case of a purchase of one to four tractors and 50 per cent in the case of batteries of five or more tractors, whether steam, gasoline or electric, and also on cable plows. The cooperative societies making the purchases must comprise at least seven members and must use the tractors in common. By an order dated July 16, 1919, the benefit of the subvention was accorded to all professional agricultural, horticultural, vinicultural and truck-gardening organizations.

Suddenly, on Dec. 26, 1919, the rate of subvention was decreased, irrespective of the number of tractors purchased, to 25 per cent in the case of machines of French manufacture and 10 per cent for foreign machines.

The French Academy of Agriculture, at a meeting held on Feb. 18, adopted a resolution to the effect that

"Whereas, the important increase of 172,000 hectares in the area planted to winter wheat in the liberated regions, in 1919 over 1918, was due to the use of power farming apparatus, and

"Whereas the French manufacturers are not yet in a position to meet the immediate demand,

"The Academy of Agriculture recommends that the order of Dec. 26, 1919, be rescinded and that the purchase of power farming equipment, irrespective of origin, be encouraged more than ever, by the most liberal bonus accorded by the Government, with a view to intensifying production."

The Fuel Problem as It Confronts the Automotive Engineer

This question came up for discussion at the last meeting of the Indiana section of the Society of Automotive Engineers. This article briefs the points developed by C. F. Kettering, of the Dayton Electrical Laboratories.

TWO vital problems confront the automotive engineer of to-day. The first is to find a method of successfully burning all, or as much as seems practical, of the crude petroleum produced, and the second is to produce a new fuel." Other important points driven home by C. F. Kettering, president of the Dayton Electrical Laboratories, at the last meeting of the season of the Indiana section of the Society of Automotive Engineers at Indianapolis were:

"During the next twenty years we must either decrease car production, increase the fuel supply, or increase the efficiency of the present engine.

"Our refining capacity to-day is adequate to handle twice our present fuel production.

"There are only 1.75 gallons of fuel produced per day for each vehicle in operation.

"The fuel problems can only be fully solved by co-operation of all the industries concerned. Co-operation and the contribution of all our scientific knowledge made it possible to win the war and will make it possible for the United States to pay its war debt in 15 or 20 years.

"Interchangeable standardization must come."

Mr. Kettering spoke to an audience of 527. His talk was demonstrated by experiments designed to show what takes place within the cylinder of an engine. He endeavored to show that the plan to use as motor fuel alcohol made from agricultural products is fallacious, because over 4,000,000 acres of land would be required to raise enough produce.

Many persons are inclined to believe that, when a fuel knock occurs under a slow and heavy pull, it is occasioned by pre-ignition simply because it can be eliminated by retarding spark. Accurate work in the research laboratory proves that the fuel knock is not what might be termed a pre-ignition knock. It is also proved that this knock does not occur before the piston reaches the upper dead center. The question then arises, How can an explosion, which occurs after the piston has started on its downward journey, cause such a forceful knock?

In case of a knock, detonation or "ping," a great number of minute disruptive explosions occur as the fuel changes its chemical structure. Gasoline and kerosene are chemical compounds, but neither of them has an exact chemical formula. The formula $C_6 H_{14}$ represents a portion of a good grade of gasoline; the latter is a mixture of various grades of hydro-carbons, varying probably between the limits of $C_5 H_{12}$ and $C_8 H_{18}$.

An appreciable interval of time passes between the moment of ignition and complete combustion of the fuel, if complete combustion does occur. It is very easy to see that the most volatile—the lightest—portion of the fuel charge will catch fire and burn first and the heavier portions will ignite last. Just after the spark has occurred the fuel charge undergoes a complete and radical change. The chemical structure, which we have referred to heretofore, becomes altered. The fuel particles start to slide around on one another. Their structure is broken up, with the result that the atoms that previously represented a molecule of fuel now represent something different and a few atoms are left over. These millions of particles of fuel in the charge which start to slide around on each other, thus breaking up their structure, begin a series of detonations.

The first of the series of these detonations occurs when the heat and pressure are sufficient to cause that fraction of the fuel with the lowest ignition point to catch fire.

As was mentioned above, when the structure of the molecules collapses, several atoms are left over. The tendency is for free atoms to combine with other free atoms. Most of the atoms are combined to form other compounds of hydrogen and carbon and the few hydrogen atoms that are left over become scattered around through the mixture.

The hydrogen particles are free, and since they burn rapidly, the flame darts from one hydrogen atom to the next with great rapidity. There are, perhaps, several millions of these hydrogen atoms that catch fire first. They serve the purpose, practically, of great numbers of spark plugs scattered through the mixture, and from each one of these burning atoms the fuel particles belonging to the most volatile fraction in the neighborhood of one particular hydrogen atom catch fire and burn, these atoms igniting the fuel particles for the first fuel fraction, and the second fuel fraction, and the third, and so on, giving the effect of an infinite number of small spark plugs that provide the means that produces the fuel knock.

As regards the various methods employed to eliminate this fuel knock or "ping," it is plain that lowering the compression pressure is a poor scheme at best, for it reduces the power of the engine. Carburetion will greatly assist in the elimination of the fuel knock. If a carbureter were designed so that it atomized the fuel almost to its molecular form, then it is probable that we would have eliminated the fuel knock entirely. Carbureters, though, have not been developed to this stage. Latest developments toward the elimination of the "ping" modify the shape of the combustion chamber. H. L. Horning of the Waukesha Motors Co. has made some improvements in which the combustion chamber is shaped to represent a conic section, with which he has secured wonderfully promising results. It has also been found that by adding certain chemicals to the fuel the fuel knock can be eliminated. Adding something that will combine with the free hydrogen particles to form a compound of as slow a burning rate as the fuel itself, will eliminate the knock.

Because of the difficulty of determining just what takes place within the cylinder, developments in combustion do not offer a lucrative field for investigation. Experimental processes are necessarily slow, because new engines embodying the constructive differences suggested by results with previous models must be built individually.

Sales in the Larger Markets of the Export Field

Month by month the American automotive exports are mounting, both in value and volume, but, despite the growing demands, many concerns are yet confining their sales to the home market or they are offering their products in no more than a few of the easier markets outside of the United States. This article was written with them in mind.

SELLING automobiles in a foreign country is much the same as selling them at home. A sales policy for the export field should be similar to that for the domestic market. Basically, at least, commerce is the same, whether in Europe, the United States, Australia, or South Africa, barring some differences of custom and local demand.

Those more or less obvious statements are made simply because they are honored only in the breach by many American firms, particularly some of those which have taken up the export business in a small and rather undetermined manner. Numerous concerns have hesitated about entering the foreign field and others have floundered about in it, largely viewing it as a closed and forbidden thing that might be opened only by the chosen few. These firms have been held to a provincial feeling that has kept them from daring a venture into the greater and larger merchandising of the world markets.

In a few words, export trade may be summed up as requiring:

1. An intelligent and vigorous sales policy.
2. Care in picking dealers.
3. Loyalty and aid to the retailers, keeping behind them at all times in their sales work.
4. Business methods of service, advertising and conduct similar in efficiency to those employed at home.
5. Recognition of local conditions and customs in all details of dealing, just as the recognition of these factors prevail in the domestic trade.

Sales in Foreign Countries

No more than a few factors make selling in Europe or Australia different from selling in the domestic market. Identical rules of business apply in each place. A good car, in normal times, will have a certain value in whatever country it is offered for sale, but a poor salesman or dealer will sell no more cars, regardless of their quality, in South America than he will at St. Louis or San Francisco. Business is business everywhere. The primary feature is the turning over of a piece of goods to a customer in return for his money. Let the money be yen or francs or pounds sterling, the basic feature is the same as if the coin had been in dollars of Uncle Sam's currency. And the sale will be made because of the same factors—the customer believes the product he buys is a product for which he has some use, which will be beneficial to him in his social or business life, and which is the best that he can buy for his money. Down to its essence, merchandising is merchandising, be it in Singapore, Wellington, Montevideo, Scranton or Poughkeepsie.

This may be revealed in a more concrete way by relating the experiences of a certain automotive company in introducing its line in one of the South American countries. The details were told recently by the company's export sales manager—a man, by the way, who has learned South America better than most men know their own country—and the facts indicate more than anything else that many firms have allowed some of the larger markets of the other half of the Western Hemisphere to remain uncultivated and undeveloped.

An International Sales Policy

The company in question has the same sales policy in each country of its widespread sales as it has at home. A dealer in Japan, Uruguay, Belgium or India—and there are few countries not covered with its products—is picked with the care and caution that would be exercised in the United States. Credits are extended or refused as they would be in America. The dealer must keep a certain stock of replacements and repair parts or he loses the agency. The salesrooms must be clean and neat and located in good parts of their city. The dealer himself must be "alive" and "on his toes" to keep the product moving. In other words, those ideals of merchandising have been found requisite for good business in America; likewise, they are necessary in the foreign field.

The company began its sales in South America only when it was determined that sufficient production had been attained and that the product had reached a high enough quality to warrant putting it on the export market. This decision was not made hurriedly or with little thought. No more was it that a sudden over-production or shortened sales found the company with a few machines it did not know how to sell and consequently wanted to dump upon the first available market without prospects of continuing shipments and future business. Some American companies have adopted such tactics to the detriment of every American exporter and the loss of national industrial prestige.

An enlarging output had made it possible for the concern to seek a larger market. Upon the basis of its success at home and with these methods of domestic merchandising ever at hand for guidance and direction, the business was expanded to include South America. This took place two years ago, at a time when numerous American competitors already were represented in the territory and theoretically at least the field was covered by strong and successful firms.

Reasons for Poor Business

But, regardless of the longer representation and the "head start" of the competitors, a recent review of the country in question showed that the newer company has sold its products greatly in excess of all of the others com-

bined. Competition from the older firms was characterized by the sales manager as being such that he scarcely considered them to be factors in the market. Several had weak sales policies and did not keep after the business. At least one did not have the production facilities to meet even a small part of the possible calls and apparently had gotten into the district long before it had reached the proper state of growth and development. Others were handicapped by inefficient dealers and poor sales connections, made when the field was first entered, with the result that those firms had never overcome the poor start.

Enlargement of the Home Market

In the domestic market, however, some of these firms put up the stiffest kind of competition, as any résumé of sales activities in this country would reveal. At home, the field was developed, dealers were properly appointed and kept on the job, sales outlets were studied and advantage taken of them, and, within the continental limits of the United States, the business of most of these concerns was flourishing and growing. In the one place, sales were vigorous and intelligently made; in the other, they seemingly were allowed to take care of themselves.

Export merchandising can be considered in no way other than as an enlargement of the home market. Instead of confining its selling within certain limits—those of the United States—boundary lines are crossed and foreign countries are taken into the fold. Sometimes this expansion may be profitable, while at others the step may not only be inconsiderate and undesirable, but it may result also in large losses of money, energy and time, to the detriment and harm of proper and more necessary business at home.

The American automotive industry has had the world markets practically to itself since the war started in 1914. Many firms have seized upon this opportunity with foresight and ability and to-day are reaping the rewards of their diligence. They have placed the American automobile and its attendant products in every corner of the globe—a place that cannot be denied to them and that for years will remain theirs unchallenged. But other concerns have just entered the field. More are yet to get into it and they are casting about now for the knowledge and the opportunities that will open to them the closed portals of these attractive and justly profitable markets.

To such firms, it may be well to remember that the world is much the same all over its surface. A half measure of ability and a doubtful effort will sell no more cars or trucks in Brussels than it would in Salt Lake City or Syracuse. An incompetent dealer, with his agency on a back street, unclean and difficult to find, will make no more sales in Rio or Tokio than would one tucked in an out-of-the-way corner of East St. Louis or Atlanta. A dissatisfied dealer, who feels that he is not getting the proper measure of support and trust, in Mexico City or Capetown, will do no more business than would a similar grouch in Topeka, Los Angeles or Washington.

Some Faults

Selling competition has been keen in America, forgetting for a moment the unusual conditions of the war and the post-war period, and the business of keeping up sales has developed the automotive industry in the United States into one of the most forward, most intelligent and most skillful selling agencies in the world. The same methods, tempered by the varying customs and demands of the individual field, will bring success to campaigns in the foreign countries. Nothing less will keep an agency above water and nothing more will be needed.

We have come to look upon the American salesman and his peppery sales manager as having developed salesmanship to an art that has no higher level throughout the globe. Behind him he has had an efficient organization, co-ordinated in every branch to aid and bolster up the selling department in any possible manner. But, a few days ago, reports came to the United States of incorrect invoices on American goods shipped to Australia. The invoices were delayed, they caused confusion at the customs house and the dealers suffered financially as a result. A similar case at home would be the improper drawing of a bill of lading, the exception being that one could be rectified within a few days, whereas the other would entail months. It seems elemental to say that such mistakes should not be made and that the best of salesmen can scarcely overcome such a handicap. But these failures were made, and not more than a few months ago.

A Middle Western business paper recently called attention to two European dealers who had ordered large shipments of certain American cars. Arrangements for payment of all but a small percentage of the accounts were made on a cash against document basis. Credits of thirty days were asked on the remainder, in one case representing less than fifteen and the other less than ten per cent of the total. But these were refused, brusquely, despite the fact that the two European concerns had been in business for many years and were thoroughly reputable. And, to complete the story, each of the dealers was quoted as saying he would give up the American lines as soon as he could obtain European cars to meet the demands.

Granting Credits

The granting of credits to foreign purchasers, with the ramifications resulting therefrom, are individual, depending upon specific circumstances, and there are, of course, scalawags in every country. In connection with the transaction just mentioned, it was said that even a superficial investigation of the dealers would have convinced the most skeptical of their ability and their good intentions in regard to the small credits asked. There are methods of credit investigation to cover the foreign countries just as there are agencies to deal with the United States. International banks and commercial bodies have been organized to further such accounts and it would seem that the same principles of business dealing would be profitable in Europe, South America and China as well as in the United States.

Export salesmanship is not easy, but, by the same token, it is an undertaking that is not impossible for the company and the men possessing the ability and the will to go after it. Thousands of dollars have been lost by companies which went after the overseas trade before they were ready to do so and before they knew definitely how they intended to proceed.

Any export manager can tell, if he will, of sporadic attempts, conceived in sudden fervor, by various concerns to capture profitable business in some distant locality. Just so, the financier can tell of the thousands who have sought the fox fire of glittering and showy investments in oil or mining stocks, but, likewise, he can tell of the men and the companies who have made successful and highly profitable investments out of such ventures. The first rushed in, without plan or knowledge, merely because someone had said the millions were awaiting the opportunist who would pick them up, while the others, backed by knowledge, ability and the will to work, built up a thing that was fundamentally sound and strong.

No easier is the export field, for the Seven Seas are dotted with the wrecks and disasters of those who chased the will o' the wisp of overseas trade. But there is a field. The world has need of automobiles, trucks, tractors, airplanes, automotive equipment, motorcycles, engines, tires and a host of attendant products. Someone should sell them and the sale will be profitable.

The Economic Place of the Motor Truck in the Nation's Transportation

Railroads, steamships and motor trucks now form the three great arms of transportation service in the United States. This article briefs the position of the truck in this trinity of industrial carriers, revealing the great usage to which it has been put and predicting its future expansion.

PRODUCTION now moves in the United States over 15,000 miles of canals and inland waterways, 259,000 miles of railways. 2,753,334 miles of highways, according to George M. Graham, general sales manager of the Pierce-Arrow Motor Car Co., at the recent Increased Production Convention of the United States Chamber of Commerce at Atlantic City. Ships, railroads and motor trucks constitute the great transportation trinity which distribute production, each having an equally important place in the general transportation scheme, said Mr. Graham. His speech, in condensed form, follows:

The relation of all three factors in respect to production would seem to be definitely established.

First—Our waterways are determined by nature's laws. For transportation with the outer world, the merchant marine is supreme. Our ships also ply our inland waterways.

Second—The steel rail has ever been the herald of development, but locomotives and cars cannot travel beyond its bounds. Experience has shown that the profitable operation of the railroad is largely a matter of bulk shipment over extended distances.

Third—The highways offer an infinite possibility of communication with points not to be reached by railway or ship.

Increasing production rests largely on the development of highway transportation. Motor trucks properly applied can aid the railways in the immense task of serving 105,000,000 persons, spread out over 3,000,000 square miles. We have never simultaneously used all three kinds of transportation to top efficiency. The highway directly touches the home life of more people than all other transportation mediums combined. A scientific and well executed diversion of product to the highways means enhanced comfort, happiness and morale for all our people.

Only lack of material, machinery or labor is a more deadly foe to production than a dearth of facilities to move it. Delayed distribution works a twofold hardship. This was demonstrated in the recent switchmen's strike. While the consumer waits for the product, he suffers inconvenience, money loss, and in some cases jeopardy of health and life. The manufacturer who cannot ship is equally distressed. His inventory piles up. He is frenzied to find storage facilities. He lacks capital to run his business and to keep his labor employed. He hesitates to turn out more product lest he aggravate his problem. So production lags and prices mount.

Economists agree that production is the remedy for most of our present ills. It is the answer to high prices. It is the panacea for labor disputes. It is the medium of mercy to Europe.

It is estimated that on the Great Lakes and Mississippi in 1918, 90,000,000 tons of freight were carried. In the same year 1,200,000,000 tons were moved by motor truck and 2,504,000,000 by rail. Much of this motor truck tonnage is haulage to railroad freight stations.

Highways have fallen short of carrying their share because it is only within the last decade that a proper medium has been developed. The man-drawn, ox-drawn, or horse-drawn vehicle, used for fifty centuries, had too limited a range. Highways could not render their service to the public until inventive genius, manufacturing skill and financial enterprise produced what we know as the motor truck.

Neither should it be forgotten that the passenger car must be considered in respect to all questions involving transportation over the highways. The utility use of the motor car has won for it a place as a staple commodity. It is essentially a transportation medium. The only difference between the truck and the car is that the truck transports freight and the passenger car transports persons. The difference between the passenger car and the railroad car is that the latter transports persons in numbers, whereas the former furnishes a quicker individual transportation of infinite convenience and benefit.

The old idea is passing that prosperity in the railroad business was to be defined alone in terms of tonnage. We are learning that volume of business does not in itself assure profits. Formerly the railroad, in its capacity as a public carrier, was not in a position to refuse unprofitable freight. No other medium was available to have it.

Temporarily our railroads have reached the limit of their capacity. They can have no greater volume. Railway Age says they are 712,400 freight cars short, and only 300,000 can be built yearly. There is an estimated shortage of 50 per cent on locomotives. Five years is suggested as the minimum time in which railroad facilities can be brought to normal. Meantime is it not sound logic that present railroad equipment should be limited to profitable work, leaving the short haul—L. C. L.—to other mediums?

No rational person considers the motor truck a rival of the railroads in long-haul traffic. In occasional emergency service it has performed wonders, but the labor factor eliminates it for long distance work. A modern freight train will move 3000 tons with a crew of six men. To move the same tonnage by motor truck would call for 600 5-ton trucks, at least 600 drivers and possibly 600 helpers.

That there may be wisdom in a rearrangement of our present methods is suggested by a brief analysis of the short haul steam railways of the United States. This

class I have limited to railroads having a maximum trackage of 100 miles, although many lines with more than this mileage render a short haul service. The figures were obtained from the Short Line Association and are accurate as of April 1. They show that 659 roads have 100 miles, or less, trackage. Their total mileage is 16,860, an average of 25.6 miles per road. Their total number of locomotives is 2491, an average of 4 locomotives per road. Some 133 roads have but one locomotive; 186 roads are less than 10 miles in length, their average being 6.4 miles, and 419 roads are less than 25 miles, their average being 12.6 miles. A foremost railroad authority has frankly conceded that no longer will such lines be constructed either as individual lines or branches of trunk lines. The future tendency will be to substitute other agencies.

The great strain in our modern transportation systems is to be found at the terminals. Freight cars move on an average of only 25 miles per day. We also have the spectacle of something like 2,400,000 freight cars with an average capacity of 50 tons carrying seldom as an average more than 32 tons in carload lot shipments and 7 tons in L. C. L. shipments. If we could, by abolishing terminal delays, make the daily average mileage 37½ miles per car, there would be a 50 per cent increase in efficiency, equivalent of an addition of 1,200,000 cars.

In the United States 26,000,000 food producers are trying to feed themselves, 74,000,000 additional American citizens and many Europeans. It is an enormous task. It has been made harder by a waste resulting from inadequate distribution. No less an authority than Herbert Hoover has said that 50 per cent of the farm production in the United States rots on the ground because of inability to get it to market.

Over American highways passes from farms to markets and shipping points a volume and value of food products of astounding dimensions. Agricultural crops, dairy products, poultry, produce and home and domestic animal production reached in 1918 an aggregate of more than $21,000,000,000. There were 5,638,000,000 bushels of cereal; 11,818,000 bales of cotton; 309,109,000 bushels of potatoes; 197,360,000 bushels of apples; 6,549,000 tons of sugar beets; 10,500,000,000 pounds of pork; 589,000,000 heads of poultry; 1,921,000,000 dozens of eggs, and 8,429,000,000 gallons of milk.

It is said that 78,000 farmers are now using motor trucks in the distribution of food. There are no less than 3000 regularly established rural motor express lines, and development that originated with the Highways Transport Committee, when, during the war, that organization was straining every effort to aid in the distribution of food. Senator Arthur Capper of Kansas points out that the motor truck is essential to the development of the agricultural interests of America, and shows $70,000,000,000 to be invested in farms—a sum equal to the total of any three other industries that might be named.

The great increase in production possible to the introduction of motor trucks in farm haulage has hardly been fairly launched. There are in the United States 6,361,502 farms of 140 acres. Any of these could find use for a truck. If only one-third should apply them within the next five years, there will be 2,120,500 motor vehicles assisting the farmer to turn out and distribute more food products at lower cost.

Not only is good production stimulated by truck haulage from the farms, but mention should properly be made of the help rendered by motor trucks to plants which mill, preserve, produce, refine, refrigerate, retail and store various food products. These are properly related to the great general scheme of production and distribution.

There is virtually not a single item of manufactured product that in some stage of its transit from the point of fabrication to the place of final application or consumption does not depend on the highways and motor trucks for rapid movement. To attempt to present even a limited record of the services so rendered would be to extend this presentation unduly.

The greatest problem facing the nation is the coordination of all road building into a national system which will scientifically assure a comprehensive system of highways under national control. The United States Chamber of Commerce, in a resolution passed at St. Louis, is already committed to such a program. We believe that our hopes in this direction will be best served in the passage of the Townsend Bill now before the Senate of the United States. This bill calls for a national system of highways to be built and maintained by the Federal Government under the supervision of a Federal Highway Commission. It involves a national expenditure of $425,000,000 to be spread over five years.

To those who argue that, in the present financial condition of the country, with taxes mounting high, the money is lacking for such a comprehensive construction —let us concede that economy is a right principle, but equally may it be said that economy should not be pressed to a point where it defeats investments necessary to prevent loss.

The high cost of living is no myth. No more is the mud road. The prime reason for high costs is the inability to deliver maximum production at prices permitting a profit to the farmer and a saving to the consumer. Waste due to unimproved roads is already estimated by figures developed in a Congressional investigation to reach the appalling sum of more than $500,000,000 per year.

More than forty-five states will hold regular sessions of their legislatures next year. The number of motor vehicle bills will number at least 3200. Business men should help the lawmakers to realize that the motor vehicle is to the public an economic asset, not an economic liability, so that out of this deluge of bills only those may be enacted into law which are fair and beneficial to the motor vehicle and the general public.

The Worthiness of Sea-Planes

AN indication of the worthiness of sea-planes—and, likewise, a demonstration of the practicality of such machines for commercial use—may be obtained from the experience of the naval air detachment of the Atlantic fleet in the winter maneuvers at the southern base. The detachment returned to northern waters with the fleet late in April, the six F-5-L sea-planes, the main battle machines of the detachment, having been in continuous service for six months. Although showing hard service, the planes were still in good condition.

The machines left the Naval Aircraft Factory in October, 1919, and, until their return to the North, had not had hangar or flying station service. They were cared for on the water or on the beach and were exposed to sun and rain in a tropical climate without protection, part of the time during the rainy season. But despite this, no hull failures were experienced and wings were rebuilt and recovered without removal. Despite the fact that the hulls were barnacle covered and the soakage in hulls and wings totaled about 1000 lb. per unit, the performance and airworthiness were excellent.

So the Worker May Increase His Efficiency and Education

Elimination of the rejected product has become one of the most difficult problems of the modern industrial establishment. Mr. Tipper asks the reason for the decreased ability of the machine worker and then points out how the employer may aid in overcoming handicaps that have arisen.

By Harry Tipper

ONE of the difficulties we are experiencing in modern industrial establishments is the lack of accuracy, or skill of the accurate type, and a decrease in the quality of workmanship. This produces its effect in decreased production, in increased inspection cost and in the budget for spoiled or rejected work.

This is not a new matter, although we have not felt it in this country to the same extent in previous years. It has been showing up progressively in the older industrial countries, with the exception of Germany, where the system of state control was sufficiently rigid to develop in its educational work a painstaking, although mechanical, thoroughness.

This situation arises partly from the reduction in the sense of personal responsibility for work, and partly in the transfer of skill to the machine, and, therefore, a continual lessening in the educational effect of work upon the worker himself.

The first of these items we have touched upon in previous articles in this series, although it will need considerable emphasis before its importance is accurately measured. Dr. Charles Eaton, in an address before the United States Chamber of Commerce the other day, referred to this lack of individual responsibility and the growth of the idea that the mass could evolve something without the individual effort. This condition is so general and is so fully expressed in the constant attempt to get improved living with less effort by forcing a redistribution through mass action, that it is very evident a large part of the working population either consciously or unconsciously believes in its possibility.

There is no rapid solution for this general lessening of the sense of individual responsibility in regard to work, and the difficulty which it imposes upon industry. Its effect upon the character of the work and the amount of it will continue, more or less, until education for the worker in fundamental and industrial matters has been accepted generally and put in use for some considerable time.

The second factor is more easily controlled and will have its bearing upon the change in the mental attitude required to solve the first factor. There is no doubt that the transfer of so large a part of the required skill to the machine has eliminated some of the most useful educational effects of older methods of skilled craftsmanship.

In one or two establishments, an attempt has been made to overcome this difficulty by the establishment of apprentice schools in which the simpler tools of industry are used, and the educational effect is secured to a larger degree than is possible in the regular production shop. Where so much skill has been transferred to the machine that the human worker can be taught to operate the machine in a few days, although he has not seen a machine shop before, there has been no previous educational work which will emphasize the value of accuracy, the necessity for care and the part which judgment plays, even in the operation of a machine of this type.

The lack of any fundamental knowledge of the purpose of the operations, the effect of the machine work, the reason for the limits allowed and the cost of poor workmanship is apparent in the character of the work and its effect upon the junk pile. Even in shops where the efficiency is high in comparison with the average, and the workmanship is conceded to be good, the inspection has become more expensive and the rejected material larger in percentage. Inspection may determine the accuracy of the finished product, but it is of no value in itself in increasing the skill of the operator. Similarly, payment by results has some effect in inducing more care on the part of the machinist, but this will not take the place of the education which obtained when the machinist was brought up through the simpler tools to a knowledge of the more complex, so that his manual skill and his mental development were properly co-ordinating in a measure of understanding as to the reasons for and advantages of accurate workmanship.

In some of the larger plants, apprentice schools have been established which are intended to secure at least a part of this advantage. In some of these schools, very important results have been obtained, although they have not been received with enthusiasm by the unions in all cases and some difficulties have been encountered in applying these educational facilities to the practical necessities of the institution. The educational efforts are, however, sound in theory and will improve in value as their practice becomes more thoroughly developed and accompanied by a more definite understanding of the necessities.

In these articles, I have touched upon the question of rotation of jobs, and the possibilities of new industrial organization studies from this standpoint. The apprentice school offers an opportunity for educating the young machinist so that he will secure an idea of the relation of one job to another and the effect of incorrect work upon each particular operation. Where it has been worked out so that the apprentice goes through a variety of operations upon a variety of jobs which are related to one another, his understanding is greatly increased, his judgment is reinforced and his knowledge of the necessities for accuracy and care is enlarged.

In one such school which has been going for a number of years and which has been very successful in providing accurate workmen, in establishing a larger production and in keeping down the cost of inspection, the regular apprenticeship period for the machinist is three years after a proper trial period. This apprenticeship takes into consideration all branches of the machinist art which are applied to the requirements of that shop.

One of the most interesting experiments in connection with industrial education was developed in the organization of Cadburys' Limited in Great Britain. Educational work has been going forward there for a great number of years. The point of particular interest in this work is the fact that in all the schools devoted to special occupations the general theory as well as the general practice is developed as a part of the school curriculum. For instance, in the school for carpenters, with its special branches, a part of the first year is devoted to the consideration of the kinds of lumber, the growth, their qualities, the way in which they work and the reason why they are applied for certain purposes and of no importance for others.

In this school, also, the simpler hand tools of the industry are used first and the development to the modern tools comes out of that previous educational work. This curriculum is broader than the subject matter developed in most of the schools adapted to industrial establishments. In very few cases do these schools go into raw materials and their consideration. Nevertheless, there is an advantage to be gained, if the instruction upon the raw materials is simplified to suit the requirements of the worker, in the broader measure of understanding and the development of the judgment which comes out of the pursuit of the subject from its foundation.

Many of the industrial schools which have been founded in connection with individual industrial establishments have been concerned too much with the development of mechanical skill on the part of the worker and not sufficiently with the mental effect of the education, in increasing the understanding by showing the relation between different operations and the effect of accurate, careful workmanship in each operation on the total result. Too little attention has been paid in most cases to training in the mental development of the worker's judgment and apparently some of the directors of these institutions have lost sight of the fact that the judgment enters into more machine operations even where the skill has been transferred to the machine to a very great degree.

This education of the worker in the development of the practice of his trade is a different matter from the general education of all workers in economic and organization matters, as has been mentioned frequently in these articles. What education may do, not only in providing skilled workers, but developing the special qualities of the individual, has been illustrated in the case of the American Multigraph Co., where as high as 33 per cent of the workers have been going to school at one time and where the sales force has been reinforced from the factory because of the development of the individual qualities of some of the skilled or unskilled workers. Opportunities for larger earning power have been presented to many of the workers because the educational system has been sufficiently broad in its foundation and specialized in its development to cover all the necessities of the business and open up all the possibilities for future growth inside the establishment.

The skill of the worker is definitely related to the foundation of understanding he possesses in regard to the work. If he has some knowledge of the relations of the various operations and how they are performed, he is given an opportunity to learn the effect of inaccuracy or poor workmanship upon the next worker's operations. He knows something about the development of the tools with which he has to work. Other things being equal, he will produce better work, will require less inspection and will exhibit more judgment than the man who has specialized upon an industrial job without having this advantage.

General schools, even though they may take up manual training, cannot be expected to apply that manual training to particular industrial requirements. They have hardly sufficient time, with the average student, to prepare the way for that by giving him sound instructions in the general requirements and the more important subjects with some manual training to co-ordinate. Industry, either through the establishment of schools in the individual plant or through the establishment of general schools in co-operation with the local plants, must undertake this educational work itself in order that we can pick up the student who has had a more or less satisfactory general grounding and apply that groundwork to the industrial requirements connected with that particular industry.

An understanding of what is involved in work in the different industries is a necessary preliminary to an understanding of the economic and organization necessities of that industry and the education along the one line will be facilitated by the practical education in the conditions of work and the relations of various operations in the industrial processes.

Practical College Training

AMERICAN colleges and institutions of higher learning have frequently been criticized by practical business men because they do not train men in a specific and definite way to take a part in industry. To gain a closer correlation between the work of the colleges and the needs of industry, a definite plan has been put into operation through the efforts of Hollis Godfrey, president of the Drexel Institute of Philadelphia. The plan has been approved and subscribed to by more than two hundred industrial firms, including the Pennsylvania Railroad, the Hood Rubber Co., H. L. Doherty & Co., and others, while nearly every college of importance is behind it.

The plan consist of four parts, as follows:

1. Business firms, individually and jointly, will write a specific order for the trained men. This order will specify in approximate terms what training the industry requires these men to have, how many men are needed and what their opportunities in business are.
2. Representatives of the colleges will write a specific statement of the school's capacity to fill the order of the industry.
3. A permanent record will be made in book form and in terms common to all concerned of the results obtained.
4. A plan of profitable co-operation will be developed, especially keeping up to date the educational needs of industry and the school's method of meeting those needs. Methods will be outlined by which future action may be taken for the best contact possible between the demand and supply of trained men.

AUTOMOTIVE INDUSTRIES
The Automobile

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Are You Burning Freight Cars?

SHIPPERS who are complaining of a lack of transportation should look well into the status of their own shipping to be certain that they are not in a very large measure depriving themselves of transportation facilities that they need so greatly in the present circumstances. Recently, railroad men and independent railroad statisticians have been checking up on the records of loading. They have reached the same conclusion.

Shippers are now loading cars an average of two tons each less than they were at the time of the signing of the armistice. Under the spur of patriotic appeal, shippers at that time put into each car all that it would hold and the railroads were anxious that this practice should continue. But the figure for maximum of actual loads has been dropping steadily and, since the first of the year, the average has been two tons less than at the climax of this movement. This is equivalent to taking 200,000 freight cars out of use.

Certainly, there is not a shipper to-day who would deliberately burn up a freight car and in this way remove it from the transportation facilities. But this light loading and holding of cars on demurrage and permitting delays in loading is just as much a sin against the maximum use of railway equipment as would be the burning of cars.

Welfare and Good Will

DESPITE its long history in certain parts of the country and its certain industries, welfare work is far from being standardized and its pitfalls may be avoided only by a painstaking preliminary study of the local situation and inquiry as to what in the experience of others has failed or succeeded under similar conditions."

This statement appears in a bulletin of the United States Bureau of Labor Statistics and is made as the result of a study of welfare work for employees in hundreds of industrial establishments in the United States. It emphasizes a significant fact which employers frequently fail to recognize when installing employees' service work. Any employee service plan is not suitable for any plant. The spirit in which the plan is installed plays an extremely important part in determining its success or failure. So-called welfare work may do more harm than good.

This point has been emphasized from time to time by Mr. Tipper in his articles on labor policy in AUTOMOTIVE INDUSTRIES. When any such plan is installed the good will between employer and employees must become greater or grow less; it cannot remain stationary. The operation of a newly installed welfare plant will cause the growth of good will, or will cause to arise new prejudices and reasons for mistrust.

Standardized Power Take-off

MANUFACTURERS of truck dumping equipment and others requiring a power take-off from the truck transmission are extremely anxious that the take-off shaft be included as standard equipment on truck transmission gearsets. At present it is often necessary to take the drive off some part of the propeller shaft, generally between the clutch and the gearset, or else to purchase a special transmission with a power take-off unit included. This means an extra expense of at least $150 for the purchaser, which generally adds considerably to the resistance in selling the equipment.

The time has come when the truck is used for such a variety of purposes that such a take-off should be as standard on truck transmissions as it is on tractor transmissions. It would result in lowering the cost to the user, which in turn would act to the advantage of the industry generally. A standard shaft length sufficient to be utilized for any of the necessary purposes should be provided, with either an S. A. E. standard spline or taper fitting. There is no reason for having a power take-off provided with special fittings on the shaft.

This is something to which gearset manufacturers should give immediate attention and, although the movement is at present under way, it should be accelerated, particularly in view of the fact that there are so many new gearsets being designed to take care of the demand from pneumatic-tired truck interests.

Airplane Power Plants

IN the design of large commercial airplanes, a great difference of opinion has arisen concerning engine mounting, one group of engineers holding out for separate power plants, each driving a single propeller, while the other group believes in connecting several engines to one or two propellers. The solution of the problem seems to depend more on the best number of propellers than upon the best number of the engines.

Germany appears to have taken the lead in the gearing of a number of engines upon a few propellers. American, British and Italian engineers have taken largely to the separate propeller for each engine. One American firm, however, is said to be planning for the proposed transpacific flight of the Navy, the use of nine Liberty engines, geared in sets of three, to drive three propellers, a practice that has had little precedent in the United States.

This divergence of opinion brings up numerous questions of engineering and design that deserve serious consideration by the builders. Whether the Germans have accomplished much by their construction is, of course, more or less impossible to ascertain, in view of the lack of knowledge concerning that enemy country. But domestic builders must keep their example closely in mind and, if there is any merit in this use of multiple engines and gearings to one or two propellers, it should be tried out thoroughly on this side of the Atlantic.

Starting on Coal Gas

GASOLINE refiners, while they have in recent years included more and more of the heavier fractions of crude petroleum in the motor fuel cut in order to be able to keep up with the demand, have kept in mind the exigencies of starting an engine in cold weather and have blended the straight run or cracked gasoline with a certain proportion of casinghead gasoline or condensed natural gas, a product of high volatility. This light fraction may not exceed 10 per cent of the whole quality of fuel, but, by the operation of the choker, such an excess of fuel is drawn into this cylinder that, even if the casinghead component alone is vaporized, a combustible mixture is formed. In this way, the starting-in-cold-weather problem has been solved.

However, the effort of the great excess of liquid fuel drawn into the cylinder is anything but beneficial. Everyone is familiar with the clouds of black smoke belching forth from the exhaust pipe when an engine is started in this way in cold weather. This is an indication of the excessive gasoline content of the mixture and, of consequence, in the complete combustion. This, of course, involves a waste of fuel, but if there were no more serious consequences, cause for worry would be slight.

When the choker is fully closed the induction of fuel into the cylinders is at many times the normal rate. Only the lighter fractions of this excessive amount of fuel are vaporized and burned. The heavier fractions will collect on the cylinder wall and dissolve the lubricating oil. The engine, therefore, is apt to have its cylinder walls practically deprived of an oil film while it is being warmed up.

This condition is especially dangerous in an aircraft engine because the load on such an engine is usually heaviest when leaving the ground and in climbing, and an engine can be damaged easily in this way. That was recognized during the war and, to obviate the risk, the plan of starting engines on hydrogen gas was inaugurated.

The thought occurs that in places where large numbers of cars are handled, as in commercial garages, it might pay to start and warm up the engines on coal gas. This method was even used in private garages to facilitate starting in extreme winter weather before the choker, the horizontal outlet carbureter and blended fuels had overcome this trouble. If it were re-introduced now it would be to prevent excessive dilution of the crankcase oil and possible scoring of the cylinder walls.

Volume of Automotive Exports

RECENT statistics of the foreign trade of the American passenger car builders show that the volume of such overseas business has never exceeded 6 per cent of the total output of the factories, last year this percentage being little higher than four. This ratio, by a careful study, reveals that many makers apparently have made little or no effort to swell this volume, leaving the bulk of it to a few of the stronger and more firmly established concerns producing in large quantities.

Several firms are now alloting 10, 15 and even 20 per cent of their output to the foreign field. They consider such a diversion as being necessary in order to strengthen their hold upon the market in the years to come when demand and supply may be more nearly equal and foreign salesmanship will be more difficult than it is at present.

But it seems that some makers are giving little or no attention to this business even now.

A BILL has been introduced in the Massachusetts legislature compelling the licensing of airdromes. One reason for the regulation, as stated by the legislator who proposed the bill, was that aviators have been allowed to land wherever they pleased, resulting in accidents and damages to farms and golf links.

Aviation, in its development as a transportation arm of the country's services, will have to face much legislation, some of which will be worth while but most of which will be detrimental. That may be expected so long as the National Government fails to take charge of the situation.

Steel Mills Eight Months Behind

Unfilled Tonnage Greatest Since War

Few Railroad Orders Included—Must Wait Long Unless Given Priority

NEW YORK, May 11—Unfilled tonnage of the United States Steel Corp. on April 30 was 10,359,747. This represents about eight months of capacity operation by all the mills of the corporation. The increase from March 31 to April 30 was 467,672 tons. The present total of unfilled tonnage is the highest since August, 1917. Except for the ten-month period at the height of the war, the present forward business is the largest in the history of the corporation. April was the twelfth consecutive month in which an increase in unfilled tonnage was reported.

The orders now on the books include only a small percentage of the materials which will be required for construction of the new equipment for which the railroads are in the field. If the orders now on hand are filled in the order of their receipt, therefore, and no new business is accepted except that of the railroads, it will be December before any attention can be given to the needs of the transportation system, even if the mills run at capacity.

While the Steel Corporation has issued no formal order of diversion to the carriers and probably will not do so, according to information obtained by the National Automobile Chamber of Commerce, persons close to the steel makers do not believe the railroads will be compelled to await their turn. All the steel manufacturers are known to view sympathetically the claim of the roads for preferential treatment of some kind or other.

Capacity Depends on Railroads

It cannot be assumed that the mills will be able to run at capacity until there has been a vast improvement in the transportation situation. They are dependent upon the railroads to a large extent for bringing in their raw materials and carrying away their product. It is probable the mills of the country as a whole are not running now at the rate of more than 70 per cent of capacity, if the figure is as high as that.

There has been an improvement in traffic conditions in the Pittsburgh district in the past few days but it has not been reflected in steel deliveries. All efforts are being bent at present upon deliveries of fuel and raw materials. The accumulation of finished products at the mills, which are without storage facilities, is becoming an embarrassing factor and one which must receive attention in the immediate future. The Youngstown, Chicago and Cleveland districts are in much worse plight than Pittsburgh in the way of production.

There can be little hope of improvement in the general manufacturing field until the railroads begin to function normally. The crux of the railroad breakdown is labor. When labor will get back into the harness and go to work again no one knows. While the outlaw strike dropped out of the newspapers more than a fortnight ago, shippers know to their sorrow that it is by no means over. When the men go back at one strategic point they mysteriously vanish from their posts at another "neck of the bottle" and endless strings of freight cars pile up on the sidings. At Buffalo last week part of the workers came back twice only to go out again each time.

Roads Hopelessly Muddled

The railroads have lacked efficiency for months. In the winter it was due to weather conditions which caused blockades. As soon as this trouble was cleared up the strike began. With these handicaps the operators have had no opportunity to show, since the roads came back into their hands, what they could do under normal conditions. They have been unable to begin the production of transportation because of the shortage of labor and equipment. It takes weeks to make shipments which should be made in days. This in itself increases the car shortage.

It was hard to get automobile cars four years ago and none has been built since that time, although automobile production has increased tremendously. It is easy to see, therefore, what is happening now. When the labor trouble ends the cars will get into circulation instead of standing idle. Shippers have tried to meet their urgent needs by turning to the express companies and now the express companies are swamped.

The railroads contend that to get the money necessary to finance their rehabilitation they must have increased rates. They undoubtedly will get them. On this subject J. B. Marvin, traffic manager of the N. A. C. C., said to-day:

Favor Increased Rates

"Automobile manufacturers are not only willing but anxious that the carriers shall have rates which will be ample to insure proper financing and equipment. They are desirous of participating in proper and fair proportion with all other industries in whatever may be necessary."

It was pointed out, however, that while an increase in rates is considered justifiable, the proposed commodity rates are discriminatory against the automobile industry and are being fought for that reason.

Railroads Await Action by Congress

Will Press Diversion Necessity if Granted Immediate Appropriation Under Law

WASHINGTON, May 10—Railroad companies requiring quick deliveries on new equipment have indicated to members of Congress and Government officials that pressure may be brought to bear on steel companies in an effort to divert large portions of this material from passenger automobile factories. Their action depends entirely upon the generosity of Congress in acceding to their demands that $125,000,000 of the $300,000,000 revolving fund provided under the Transportation Act, be made available immediately for the purchase of equipment allocated to the railroads in proportion that the standard rental bears to the total rentals.

R. S. Binkerd, assistant to the chairman of the Association of Railway Executives, stated this week that there had been considerable grumbling among car builders and railroad owners over the so-called monopolization of steel by automobile factories. To the best of his knowledge no actual figures have ever been submitted as to the amount of steel that the railroads want diverted from the automobile industry.

It might be true, he said, that individual roads badly in need of equipment have submitted estimates on diversion but no definite action has been taken by the organization of executives. Two years ago, the Railroad Administration compiled data on steel which should be diverted but it was during wartime and conditions have changed materially so that these estimates are now obsolete.

Diversion Orders Held Up, Says Reeves

DETROIT, May 10—Fear of a steel shortage in the automobile industry resulting directly from diversion of the output to the railroads has been dissipated, it was said to-day by Alfred Reeves, general manager of the National Automobile Chamber of Commerce. He said a letter announcing such a plan of diversion had been prepared by the United States Steel Corp., to be mailed to automobile manufacturers, but that it never was sent out.

Reeves declared he did not believe any action would be taken now in that direction by the steel makers. He added, however, that there is now and will continue to be a shortage of steel because of decreased output and inability to transport it from mills to factories.

Banks Hold Tight Rein on Credits

Borrowers' Needs Closely Scanned

All Available Funds Needed for Essentials—Expansions Frowned Upon

(*Continued from page* 1094)

ican banks have shut down rigidly on credit for dealers in raw silk and many a "shoe string" speculator will go to the wall. Tricolettes which sold for $6.50 a yard two months ago now are being offered at $2 a yard.

Deflation also has hit the raw fur market. Traders and speculators have been forced to liquidate in the last two months because banks have begun to call loans and will give no accommodation to small dealers unless their propositions can stand the most searching inquiry.

Some of the largest department stores in New York have announced sweeping reductions in every article they sell, ranging from pins to pianos. Several theories have been advanced as to their purpose. One is that there has been a marked falling off in business of late and that they see a greater slump in prospect. There is no authoritative information as to what bearing the credit situation has had on their action, if any. The ready-made clothing business is virtually at a standstill. There are indications that the orgy of extravagant spending which has swept the country is coming rapidly to an end.

Millions Tied Up in Warehouses

One factor which put an added strain on the credit structure was the outlaw railroad strike. A conservative estimate of the value of goods tied up in transit for weeks is $100,000,000. The banks have had to finance these shipments until they could reach their destinations. This is only one phase of the effect upon credit of the virtual collapse of the transportation system. Hundreds of millions of dollars worth of goods ready for shipment and with consumers eager to get them are held in warehouses because freight cars cannot be obtained to get them over the rails to their destinations.

This is one of the main reasons for the tightness of funds in the Kansas City district. The farmers cannot move their wheat to the mills and the seaboard. They must be financed until they are paid for their crops. A contributing factor is the fact that Federal control of wheat ends June 1 and the farmers expect higher prices after that date. Flour prices already are rising and this year's crop will be short many millions of bushels.

A good many business men and financiers, while realizing that a drastic cut in prices would have a deplorable effect on business until the adjustment had been completed, hold that there is no other way to bring labor to its senses and get back on a sound economic basis. They believe that the depression incident to deflation would be short-lived owing to the fact that the world has been living partly on accumulated capital for a considerable period and there is consequently an acute shortage of goods the world over.

Need to Liquidate Labor

The requirements are so pressing, they contend, that once it became possible to adjust manufacturing costs to a reasonable level the recovery would be rapid and the accompanying prosperity great and enduring. But before there can be real prosperity,. they believe, labor must, in a sense, be liquidated—the man must seek the job instead of the job seeking the man as at present. The trouble now is not merely that wages are high. Much more important is the fact that production has fallen materially and no pronounced indications of improvement in this respect are discernible.

With credit already strained to the breaking point, the railroads recently returned to private ownership have come into the market with demands for $100,000,000 worth of equipment which they contend is absolutely imperative if the transportation system is not to collapse still further. Not only must the money be found to pay for this equipment, but the steel must be found immediately to make it.

Gasoline Advances to 30 Cents Wholesale

NEW YORK, May 11—The Standard Oil Co. has sent out notices announcing that beginning to-morrow the wholesale price of gasoline will be increased from 28½ cents to 30 cents a gallon. It is not expected there will be a uniform advance in retail prices to meet this increase. It probably will range from 34 to 37 cents.

The latest increase marks an advance of 6 cents in the wholesale price in the last four and a half months. Prices also will go up in other parts of the country. One year ago motorists were paying 27 and 28 cents retail for gasoline.

Still higher prices for automobile fuel have been predicted for months because of the shortage of crude oil but it has been asserted by the petroleum and automotive interests that it would not rise to the levels forecast in some quarters. Committees representing the National Automobile Chamber of Commerce, the Petroleum Institute of America and the Society of Automotive Engineers are working out ways and means to enlarge the supply of gasoline but no report has been made on the progress they are making.

Move Foodstuffs to Relieve Banks

Car Shortage in East Further Aggravated by Special Demand in West

WASHINGTON, May 11—The already serious car shortage in the East is being still further aggravated by the sending of every available car to the West for the movement of perishable foodstuffs. Chairman Kendall of the Car Service Committee of the American Railway Association said to-day this action was being taken in accordance with the transportation act and rulings of the Interstate Commerce Commission.

Part of these cars are being rushed into the wheat belt to bring East the surplus of wheat which has piled up in elevators because of the lack of transportation facilities, thus placing a strain on bank credits. Refrigerator and other cars suited for the movement of perishables have been sent at top speed to move the California fruit and vegetable crop before June.

Kendall declared that the cars belonging to western roads which are now on the tracks of eastern lines are far in excess of the requirements for these purposes. He added that diversion of cars for food shipments would have no bearing on the movement of automobiles. He explained that he thought automobile shippers "are fairly well satisfied" because he had heard fewer complaints from them of late.

BODY MAKERS FAR BEHIND

LANSING, MICH., May 8—In a letter to stockholders, General Manager W. V. C. Jackson, of the Auto Body Co., states that unfilled orders amount to approximately $4,000,000 at good prices, many of them based on market values at time of delivery. The statement also shows that March was the biggest month in the history of the company, the shipments amounting to $360,000. A mark of $4,000,000 is set for the business this year. Shipments in April, despite the strike handicap, ran around $300,000. A substantial increase in surplus, after payment of dividends, taxes and all charges, also is noted in the statement.

TO BUILD FORD TRAILERS

CINCINNATI, May 10—Trucks for use with Ford cars are to be manufactured by the Universal Car Co. of Cincinnati, in a department which is to be built at a cost of $150,000. The factory will open a new field in the Middle West for truck cars of this type. The fact that the plans are being drawn at the Ford plant in Detroit is taken to mean that Ford is interested in the project.

Detroit Production in April Passes 100,000 Despite Strike

Actual Figures Are 111,961 Passenger Cars, a Falling Off of 64,870 from March Totals—Truck Production of 15,771 Retains Strength

DETROIT, May 10—Production in the Detroit territory slumped to 111,961 passenger cars in April, due to the railway strike, as compared with 176,831 in March. Truck production for April was 15,771. The figures include all of Michigan and the Willys-Overland and Willys-Knight companies in Ohio.

Spurred by the unprecedented production during March, factory executives had hoped to greatly increase their output during April, and the sudden blow launched by the switchmen was a disheartening factor. All factories, however, have recovered quickly, and since the restoration of power have again reached 100 per cent production as regards schedules.

With fuel coming in, however, and that handicap eliminated the ogre of material shortage looms large. This is due chiefly to the attitude of steel manufacturers who have determined to divert steel from all industries to the railroads. Just what effect this will have is problematical. Many executives contend it is a physical impossibility for the railroads to use all the steel, even if financial arrangements had been perfected.

Although there has been no settlement with the striking switchmen and yardmen, deserting strikers and volunteers are manning trains and freight is moving more freely, not to an extent, however, to insure delivery of material and parts, and many of the factories are continuing truck fleets bringing in supplies, which was inaugurated when the strike first broke.

Ford Nearing Goal Fixed

The Ford factory, which continued operation when all the others went down, laid off 26,000 men April 19, and they did not go back until April 26. Ford had prepared for the fuel emergency, and was able to run pretty close to schedule for the first 10 days of the strike. As a result the Ford factory built 51,066 cars and 7,179 trucks during the month. For the nine months ending April 30 Ford production was 722,915, with three months to go to complete the scheduled output of 1,000,000 during the fiscal year.

Packard was more fortunate than most plants, and was down only two and one-half days throughout the month. Packard had fuel on hand when the power ban was put on, but ran short before power was restored. However, production was only slightly affected.

Paige-Detroit ran steadily, though production was cut considerably, the limitation of 40 per cent of power hampering the factory effort.

Dodge Brothers operated on about a 50 per cent schedule throughout the month, and production was practically cut in half. Dodge officials expressed gratification, however, at being enabled to maintain the organization, and is now on a normal basis.

Liberty Motor Car Co. was another one which ran throughout the strike on the 40 per cent power basis holding its organization. Production in the Liberty plant, however, was cut about one-fourth as compared with March.

State Plants Hard Hit

Oakland was down two weeks, and the same practically was true of all plants in Pontiac. Oakland, however, kept all of its men busy in the body plant, and during the last two weeks of April was enabled to bring its production close to the output scheduled for the month. Oakland still is without freight cars and practically everything is being driven from the factory. Materials still are being brought in in truck fleets.

Flint factories suffered likewise, and Dort put out but 2,000 cars during the month. The Dort factory is more fortunate than others, in the fact that it now has 28 freight cars loaded with automobile engines en route from Pennsylvania. A great majority of the Dorts, however, are sent away from the factory under their own power, it being practically impossible to get freight cars to handle them.

Buick Motor Car Co. was down four days, but managed to get out 10,000 cars, running very close to the scheduled output. Chevrolet lost considerable time as a result of the strike, but was enabled to make about 50 per cent of its schedule.

The Overland factory was down nine days, but all efforts were centered in production of Knight cars with the result that there was an increased production of Knights during the month as compared with March and a great decrease in Overlands.

Cincinnati Plants Closed by Strike

CINCINNATI, May 8—With half of the 12,000 machinists in Cincinnati on strike and approximately 700 automobile mechanics out, the manufacturers of motor trucks and truck parts, as well as garagemen, are greatly handicapped.

The Otto Armleder Co. closed down part of its shops when 175 men failed to report for work. The G. A. Schacht Motor Truck Co. has a number of men out, with its plant picketed by the strikers. The United States Motor Truck Co. has "fired," according to its announcement, half of its force because they refused to sign an agreement not to join a union.

The Schacht firm, Trailmobile company, Ahrens-Fox Fire Engine Co. and several other plants engaged in motor truck manufacture or truck parts, appear as signers, among a list of 80 machine tool and manufacturing concerns, of full-page advertisements in the daily newspapers, declaring the demands of the machinists for 25 per cent higher wages, is unjust and "cannot be met either in whole or in part."

"We have fired one-half of our force because they were disloyal to the company and will not sign an agreement not to join a union," says the announcement of the United States truck plant. General Manager F. E. Alwin supplemented this statement with the announcement that "radical labor has a habit of loafing on the job and we will not pay good wages to a man who loafs." He intimated that the men who were "fired" included some of the ringleaders and that none of the group would be taken back. Guards have been placed around the plant.

S. A. E. Seeks Answer to Production Problems

NEW YORK, May 12—The Society of Automotive Engineers, seeking to act as the go-between among the leading manufacturers in focusing attention upon production problems as they relate to the engineer, has sent out a questionnaire, inviting answers to the following inquiries:

1—Aside from raw material, what is the largest single factor affecting your production at the present time?

2—What do you consider your biggest single achievement in production in recent months?

3—What is the most important contribution that the Society of Automotive Engineers can make in helping manufacturers solve their production problems?

4—What production engineering subjects would you consider pertinent at the present time for discussion among S. A. E. members?

TRACTOR COURSES CUT COSTS

LOS ANGELES, May 9—An attack on the high cost of service for tractors on the Pacific Coast has been launched by the California Tractor and Implement Association and the State University of California through the medium of tractor schools in many parts of the State. Two weeks' courses are given in any locality registering enough students to warrant the course. To date schools have been held at Healdsburg, Napa and Fresno with registrations of from 60 to 100 owners. A small fee is paid by registrants which helps to meet expenses of the school, but the bulk of the required money is furnished by the California Association. Through the courses tractor instruction is being brought to farmers who would not come to tractor demonstrations.

Indianapolis Plants Hard Hit by Strike

April Production Slumps Far Below Normal Through Failure of Supplies

INDIANAPOLIS, May 8—Manufacturing conditions in Indianapolis in the motor car plants are bad, indeed, as a result of the shipping breakdown brought about by the strike of the outlaw switchmen. From expression of factory executives, conditions, while not getting worse, are not improving. And Indianapolis has not been hit as has some industrial centers.

Production during the month of April in nearly all Indianapolis factories was, perhaps, 50 per cent of normal, according to George M. Dickson, of the National Motor Vehicle Corp., and production as low as that is conducive to spoiling the disposition of the factory men, who are striving to supply the demand for cars.

Drive-aways are the feature of the outgoing distribution, but because of the breakdown of transportation, materials and parts cannot be brought in with consistency to give a steady production.

Cole Motor Co., despite rail conditions, sent out 850 cars, 75 of which went to foreign trade, the remainder to domestic production. The production at the Stutz Motor Co. plant was approximately 375 cars, way below the standard, with manufacturing all upset because of the shipping conditions. Premier, with a rather good supply of material on hand, was able to build and send away during April 201 cars, mostly via drive-aways. Production of the Monroe Motor Co. was disturbed greatly, due to the inability of the railroads to get shipments of materials to Indianapolis.

The Nordyke & Marmon Co. slowed up in production because of freight conditions but with a big reserve of materials were able to produce 625 cars. This figure was not at all that the orders for Marmons would justify and which could have been built. The makers of the Spacke car gave their production for the month and their shipments away as 200, a figure less than half what it should have been had conditions been less abnormal.

PREST-O-LITE INJUNCTION HOLDS

CINCINNATI, May 8—United States Circuit Court of Appeals in Cincinnati to-day affirmed the decree of the United States District Court at Toledo, enjoining the Auto Acetylene Light Co. from refilling the acetylene tanks of the Prest-O-Lite Co. The decision was handed down by Judge Knappen.

FRENCH WAR SALES, $121,749,755

PARIS, April 20 (*Special Correspondence*)—A total revenue of $121,749,755 has been obtained by the French Government up to the present date, for the sale of army automobiles and trucks. This does not include automobiles transferred to other Government departments, nor the revenue from pneumatic and solid tires and spare parts. This amount is the biggest obtained by any allied government for the sale of war automobiles. In this total are included French and American army material sold in France. British war vehicles were sold here, but as the sales were handled direct by the British Government, the amount does not figure in the French total.

Shipyards Acquire British Motor Steel

LONDON, April 21—(*Special Correspondence*)—Shortage of steel plates, which come almost exclusively from Scotland, is likely to cause a serious situation in the motor industry in the near future. One of the mills which has been a very important producer of plates has been acquired by a shipbuilding combine which will use it for its own purposes. Manufacturers are short 50 per cent of steel for chassis frames.

The Chamber of Commerce of Coventry has sent a communication to the Board of Trade pointing out that manufacturers are regarding the future with alarm. The difficulty is chiefly lack of labor, for men prefer to work on heavy boiler plates rather than motor car frames, as they are paid by tonnage.

Cottrell Named Head of Bureau of Mines

WASHINGTON, May 10—President Wilson has nominated Dr. Frederick G. Cottrell for Director of the Bureau of Mines, to succeed Dr. Van H. Manning, resigned. Dr. Cottrell has been assistant director. It was largely through his efforts that a plant for recovering helium gas on a large scale for military aeronautics was erected near Petrolia, Tex.

NEW YORK LIMITS TRUCKS

ALBANY, May 8—Governor Smith has signed a bill limiting the size of motor trucks in use on country highways to 8 ft. width and 12½ ft. height, with a combined weight of truck and load not to exceed 25,000 lb. Truck manufacturers say comparatively few users of heavy trucks will be affected by the law as there are only a limited number in use in this state which will come within the prescribed weight limit. The law applies only to the country districts of the state and users of trucks in cities will be immune from its provisions.

COLE MAKES RECORD SHIPMENT

INDIANAPOLIS, May 8—The Cole Motor Car Co. this week sent from Indianapolis what is said to be the largest single shipment of high grade motor cars to a single foreign distributer, in the 25 carloads of cars to William Coles & Sons, Ltd., of London. This firm now has a contract with the Cole company for 100 cars monthly.

Sheridan Motors Formed by G. M. C.

Will Make Medium Priced Car, Designed by D. A. Burke, at Muncie

NEW YORK, May 9—The Sheridan, an entirely new car to be built by the Sheridan Motor Car Co., a subsidiary of the General Motors Corp., at Muncie, Ind., will be on the market within 90 days. There will be four and eight cylinder models. Experimental work on the lighter car has been virtually completed and soon will be on the eight. The prices have not been definitely fixed but the four will sell at around $1,800 and the eight for about twice that sum.

The Sheridan is the child of D. A. Burke, one of the old timers in the Buick organization. He was branch manager in Chicago for four years. While he was selling the Buick, Burke dreamed nights about the kind of medium priced car he would like to sell. He pictured it in his mind and then he drew crude sketches of it. When he had thought it all out he went to see W. C. Durant. Durant told Burke to go ahead. The Sheridan Motor Car Co., of which Burke is president and general manager, is the result.

Burke went down to the Chevrolet engineering department in West Fifty-sixth Street and started work last September. He divided his time between the workshop and Muncie. Sheridan Motors bought the plant of the Inter-State Motor Co. and began to enlarge it. The buildings have been equipped in the most modern way, and there is a plot of 47 acres for future expansion. The factory will get into action within a month with 15,000 cars as the goal for the first year.

Burke isn't quite ready to tell all the details about the Sheridan, but he says, rather proudly, that it isn't a freak. He has nursed for years the idea that there could be produced a moderate priced car of which the owner might be proud. He has bent his efforts to that end. He will use only the best of materials and the workmanship will be of the highest type. There will be no skimping anywhere. The chassis will be put together for strength and comfort, and the body will be built for comfort, strength and beauty. The tonneau will be deep and roomy, and the whole car will be long and graceful. The lines of the four and eight will be similar.

Company Now Organizing

A beginning has been made in building up a Sheridan organization but the details are not yet available. It is expected a description of the car will be ready in about a month. The price will not be fixed until the cost of the materials and equipment have been figured out. This hasn't been done yet. Provision will be made for a reasonable margin of profit but the car, nevertheless, will be held to its special price class.

Manufacturers Seek Political Rights

National Association Will Demand Recognition of Just Demands of Industry

NEW YORK, May 10—The National Association of Manufacturers has decided the time has come for its members to get into politics and insist upon a recognition by both parties of the just demands of industry. A platform to be presented to both great parties will be reported by a special committee to the convention of the organization at the Waldorf-Astoria in this city, May 18.

The platform was drafted by a subcommittee headed by A. L. Humphrey of the Westinghouse Air Brake Co. With him were associated James A. Emery, general counsel of the organization, and ten manufacturers from different parts of the country. All phases of the business and industrial situation were threshed out by the committee. The text of the platform will not be made public until it has been passed upon by the convention, but it can be said it will contain planks covering these subjects:

Industrial relations, transportation, merchant marine, taxation, Government relations to industry, immigration and Americanization, banking and finance, integrity of the courts, and bonuses for veterans of the World War. Reference probably will be made to compulsory arbitration and collective bargaining. The need of a Federal budget system may also be touched upon. It is possible a favorable stand will be taken for higher freight rates to rehabilitate the railroads.

The association is composed of 5400 manufacturers employing approximately 6,000,000 men and women.

WILLYS BUYS FOSTORIA SITE

FOSTORIA, OHIO, May 10—Plans have been completed for the erection here of a large ignition plant by the Willys-Overland Co. This plant will be the first unit of a group of factory buildings to be erected on a tract of 50 acres recently purchased by the company. The work of construction will be started within two weeks.

CENSUS SHOWS AMERICAN CARS

LONDON, April 21 (*Special Correspondence*)—A recent census of cars on the British market, which gives the following list of American makes—the name in two or three cases being either coined for the British market or denoting vehicles assembled here from imported components: The Amco, Anderson (six), Apperson (eight), Bethlehem (this car is listed but has not arrived), Briscoe, Buick (six), Cadillac (eight), Case (six), Chalmers (six), Chambers, Chandler (six), Chevrolet, Cole-Aero (eight), Columbia (six), Commonwealth, Dixie-Flyer, Dodge, Dort, Elcar (six), Elmo (electric), Essex, Ford (Anglo-American), Foster, Grant (six), Haynes (six), Hudson (six), Hupmobile, Jordan (not yet arrived), King (eight), Liberty (six), Maibohm (six), Maxwell, Mitchell (six), Moon (six), Nash (six), Oakland (six), Oldsmobile (eight), Overland, Paige (six), Packard (truck), Peerless (eight), Pullman, Reo, R. M. C. (six), Roamer (six), Saxon, Scripps-Booth, and Templar. It is possible that the Owen Magnetic car will be seen in Great Britain.

DuPont Production to Begin in July

WILMINGTON, DEL., May 10—DuPont Motors, Inc., of which E. Paul duPont is president, has begun the construction of a modern factory at Moore, Pa., on the outskirts of Philadelphia, where the company has bought a 10-acre plot of ground. The company is bringing out the new duPont automobile. The new factory, it is expected, will be ready for occupancy by midsummer, and in the meantime production will be carried on at the Wilmington plant.

The first duPont cars will be delivered about June 1. The new car is a four-cylinder job, to sell at $4,000. It is built for speed. The body lines are unusual. President E. Paul duPont announces that the three duPont models, the touring car, roadster and closed car, will all be in production by July. Production on the touring car and roadster starts next month. DuPont distributers have already taken the entire output for 1920, so that there is no sales problem.

Floating Exposition to Develop Trade

SEATTLE, WASH., May 10—A floating exposition of American manufactured goods, shaped largely after similar projects conducted by various European nations in pre-war years, has been undertaken by a Western organization of foreign traders, with headquarters in Seattle. The exposition, which has been indorsed by the Seattle Chamber of Commerce and Commercial Club and other organizations, is scheduled to leave the Pacific Coast late this summer for a tour of eight months that will embrace the chief commercial centers in Latin America, Australasia and the Far East.

Negotiations for the chartering of a big vessel for the tour, according to Manager M. E. Fisher, are about to be consummated. A large number of nationally known manufacturers, including several automobile exporters, have already signed contracts for exhibit space.

BLACK & DECKER OPEN ROOMS

PHILADELPHIA, May 10—The Black & Decker Manufacturing Co. of Baltimore has opened a showroom and service station at 318 North Broad Street. It has on display several types of lectro-flaters, air compressors, pistol grip and trigger switch portable electric drills. The branch is in charge of W. C. Allen of Philadelphia, manager, and E. Harris, Baltimore, assistant manager.

Britain Far Behind on Trade Balance

Imports of Cars and Chassis Far Outweigh Exports — Tire Exports Increase

LONDON, April 21—(*Special Correspondence*)—In March Great Britain exported 234 vehicles and 175 chassis of the combined value of $1,454,000, and parts of the value of $734,000. The export value of British tires of all kinds was $2,450,000. The motor vehicle imports were notably large, these being 2859 complete vehicles, and 1066 chassis without bodies. Their combined value was $7,144,160. The value of imported chassis parts was $2,550,000, and of imported tires, $1,759,000.

During the first quarter of this year Great Britain *has imported* 7427 *vehicles and* 2875 *chassis, and exported* 607 *vehicles and* 357 *chassis.* This serious adverse balance was in part redressed by the export value of British tires, namely, $7,555,235, as against $5,991,165, the value of tires imported. Looked at from another point of comparison the discrepancy of the vehicle and chassis figures for the three months is more striking. Thus for the first quarter *of* 1919 *Great Britain imported* 141 *vehicles and chassis, whereas for the same period this year the combined figures were* $10,284. In March, 1919, Great Britain *imported* 63 *vehicles and chassis,* whereas *this March the figures were* 3925. Applying the same basis of comparison to British exports of vehicles and chassis, the combined figures for the first quarter are 411 in 1919, 964 for 1920, and for the month of March only, 289 in 1919, and 409 in 1920. These figures are a sufficient index to the state of the British industry and indicate the enormous demand there exists for cars.

VENEZUELA AGENCY OPENS

NEW YORK, May 1—A commercial agency for the United States of Venezuela has been opened here, with offices at 42 West Thirty-ninth Street, with E. Arroyo Lameda as commercial agent in charge. Lameda is desirous of furnishing industrial firms with all available information concerning commerce in the Venezuela Republic.

STEVENS PLANT NEARLY READY

CHICOPEE, MASS., May 10—The second unit of the new Stevens-Duryea factory buildings is practically completed and will soon be put into active use. In these the bodies will be mounted on the finished chassis, prepared, painted, finished and trimmed. It is expected shipments will soon begin. Permits for three more buildings on the Willimansett property, at an estimated cost of $400,000, were issued this week. Two of the proposed buildings are to be 320 x 300 ft. and the third, known as the heat treating building, will be 270 x 50 ft.

Getting Things Done, Art of Management

Taylor Society Discusses Problems of Industry at Rochester Conference

ROCHESTER, N. Y., May 8—A conference of the Taylor Society, an organization devoted to the propagation and development of scientific management, was held here May 7 and 8. Among the most interesting of the papers presented was that of William O. Lichtner on "The Promulgation of Standards by the Taylor Society." Lichtner pointed out the confusion generated by the use of various terms to describe the same thing and advocated the preparation by the society of a dictionary of standard terms for use in scientific management and production work. He also proposed the promulgation of standards for functions and executive titles of an organization, for policy on bonus payments, for policy of base rates and total earnings, and for a reference library for books on industrial management. A committee was appointed to take up the work suggested by Lichtner's paper.

Ward Harrison, illuminating engineer, pointed out the ultimate economy and the increased production possibilities of proper industrial lighting in his paper on "The Necessity for Standards of the Relation Between Illumination and Output." He stated that statistics showed an increase in actual production of between 10 per cent and 20 per cent in plants which had changed from old-fashioned to modern lighting systems.

Probably the most significant paper of the conference from the standpoint of industrial relations was presented by Dr. William R. Leiserson on "The Worker's Reaction to Scientific Management." The speaker defined management as "the art of getting things done" and pointed out that managers are too often desirous of asserting their authority instead of seeking the best methods of really accomplishing something. He showed that a knowledge of the fundamental lessons of psychology were necessary in anyone who is to be a successful manager of men.

The final address of the conference was given by Ernest Martin Hopkins, president of Dartmouth College, on "The Industrial Problem." He traced the political and economic reactions of the people after wars of the past and through them pointed out an interpretation of the present industrial unrest together with a general solution for it. This solution consists chiefly in bringing back, through some means or other, to the workman that interest and joy in his work which obtained before the specialized development of modern industry.

ONEIDA TRUCK SETS OUTPUT

GREEN BAY, WIS., May 10—The Oneida Motor Truck Co. of Green Bay, Wis., reached the highest production in its history when it turned out 130 trucks during the month of April. The May schedule is 150 trucks, and by June an appreciable increase will be made possible by taking over at least a part of a large machine shop now under construction. To overcome the handicaps of railroad strike difficulties, a motor truck line was established between Green Bay, Milwaukee and Chicago, while deliveries to purchasers were made over the highways, trucks being driven as far as Baltimore, Md.

Uniform Theft Law Ready for Legislation

NEW YORK, May 10—A uniform law to cover thefts of motor vehicles has been drafted by the Motor Vehicle Conference Committee and will be made public in the near future. As soon as it has been subjected to comment and criticism by those best qualified to deal with the subject a bill will be prepared for introduction in all State legislatures which hold sessions next year. It will contain all the best features of the most successful State laws now on the statute books.

Few of the States have enacted laws which cover all the aspects of the problem. There has been little uniformity in this legislation and there is little similarity in the machinery set up for prevention, detection, arrest, trial, conviction and punishment of motor vehicle thefts. As a consequence co-operation between States is impracticable.

The proposed uniform law has been drafted by a sub-committee composed of J. Howard Reber, counsel for the Autocar Co., as chairman; W. Eugene Turton, chairman of the legislative committee of the American Automobile Association; C. A. Vane, counsel of the National Automobile Dealers Association, and S. S. Meyers, counsel of the Motor and Accessory Manufacturers Association.

H. C. S. CARS ON MARKET

INDIANAPOLIS, May 8—The ten H. C. S. demonstrator cars manufactured by the H. C. S. Motor Co., the first production of that factory, have been shipped to distributers, one of which is being used in Indianapolis.

Salesmanager Ford, of the H. C. S. company, said production is under way as large as possible with the limited manufacturing space and transportation conditions. The new factory buildings of the company are not progressing as they should because of labor conditions in the building trades.

UNIVERSAL BUYS NEW SITE

OSHKOSH, WIS., May 10—The Universal Motor Co., Oshkosh, Wis., manufacturer of farm lighting systems, gas engines, etc., is having plans prepared for a new plant on a site 300 ft. square recently acquired. The present works have an area of 12,000 sq. ft., the ultimate limit, and an output of 225 systems per month. The Universal Foundry Co., associated with the motor company in a general way, and providing its castings supply, is doubling its molding floor space and installing an additional cupola.

Farm Questionnaire Shows Truck Demand

Detroit Sales Managers Told of Prospects for Vast Immediate Sale

DETROIT, May 9—One million immediate farmer truck prospects are seen by the Goodyear Tire & Rubber Co. As a result of 25,000 questionnaires sent to farmers, granges, etc., over the entire country, to which replies from individuals and organizations indicate the attitude of some 42,000 of all classes of farmers, the Goodyear company has brought to light some interesting data as regards future sales of trucks to farmers. This information was the subject of a lecture given by D. M. Pettit, of the Goodyear truck tire department, who talked to a meeting of the sales managers of Detroit truck manufacturing concerns this week.

Pettit based his suggestions upon the results of the questionnaire and upon the statistics of the Department of Agriculture. The value of farm production last year was $25,000,000,000. During the years 1917 and 1918 the increased cost to the farmer was less in proportion than his increased receipts. In 1919, conditions were more nearly equalized in this respect and the farmer's clear profit was smaller on a percentage basis. In the year 1919 there was $80,000,000,000 invested in farming.

Of particular interest to the truck sales managers was the fact that of the 5000 replies received, which represented a total of about 42,000 farmers, due to the replies from granges, 44 per cent were considering buying trucks. There are 6,700,000 farms, and it is estimated that the replies received were typical of the upper 2,000,000 of these farms and this would give about 1,000,000 immediate prospects for trucks. Of those who were prospective truck buyers, 42 per cent occupied farms between 100 and 200 acres and 52 per cent over 240 acres. Of all of the replies received, 76 per cent were horse users and 26 per cent truck users. The votes in favor of the different capacities showed the 1, 1½ and 2-ton types to be in greatest demand, the 2-ton being called for on the larger farms.

Financial Aid Sought

In reply to answers asking why those who believe in trucks did not buy them immediately, 33 per cent gave reasons which may be classed as financial and 11 per cent due to inferior roads. On votes taken in favor of pneumatic or solid tires, 50 per cent wanted pneumatics and 45 solid and 5 per cent wanted solid rear and pneumatic front. Regarding the usage of the truck, the biggest percentage by far hauled grain and live stock. Of the users of trucks, 69 per cent found they were able to get better prices for their products for such reasons as increased range, less shrinkage in product and a great variety of other reasons. Of the truck users, 53 per cent haul farm produce for others, which indicates the possible market for rural freight.

Government Experts Seek Gas Substitute

Experimental Station at Arlington Will Study Possibilities of Gas from Straw

WASHINGTON, May 8—It is apparent that the United States Government has awakened to the fact that a scarcity of fuel for motors would present a formidable problem. The ever-increasing demand for gasoline has revealed to the Government the necessity for development of substitutes. To this end various chemists' organizations connected with the Governmental departments are now devoting their attention to the production of gas from straw.

At Arlington, Va., just outside of Washington, a corps of specialists is constructing special equipment to conduct experiments in this heretofore unexplored field. While the construction work is under way chemists are making a special study of the undigested mass of laboratory reports assembled from all parts of the world.

Washington chemists have taken advantage of the experiments and actual road tests conducted in London, and at the University of Saskatchewan, Saskatoon, Canada. It was here that Prof. McLawrin showed the possibilities of using straw gas in the operation of tractors in the great Northwest. He purchased two huge gas bags from traction companies in London. These bags were used as containers for commercial gas which was used to operate motor vehicles in London, during the gasoline shortage of 1917 and 1918. Now, as then, the chief difficulty of this method is compression. The gases take up too much space for economy. The average run of motor vehicles operated by this means has not exceeded 15 miles. The cost of replenishing the gas supply several times a day is too excessive for ordinary use.

The equipment now being installed at Arlington will permit destructive distillation of straw for the purpose of producing a gas on a large scale. If the results warrant the expenditure of more money, assurances have been given by Congressional committees that appropriations may be had on application.

Need Compact Transport Means

The Government officials who are lending their aid to this important research believe that it can be carried out successfully in a small way in the great farming communities with the large amount of straw which usually goes to waste, or at best is used for bedding. Scientists know that gas can be produced from straw. If some method can be devised which will permit the transportation of this gas in a compact form, it is quite certain that automotive engineers, especially those interested in tractors, will also find themselves with a problem to solve.

This straw gas in its chemical compression is similar to coke gas used for heating and lighting purposes. Experiments show conclusively that there is sufficient air in straw gas to eliminate the carburetor. In all tests conducted on stationary engines it was found necessary to close the air intake. In its explosive qualities the new gas compares favorably with other fuels. Straw gas, it is said, runs close to 400 B. t. u.

Straw costs practically nothing in the great agricultural districts. The expenses of drilling and refining which must necessarily come with the production of gasoline are eliminated in the manufacture of this substitute. From 10,000 to 12,000 cu. ft. of gas have been produced from a ton of straw.

Winther Motor Company To Build Light Car

KENOSHA, WIS., May 8—A 6-cylinder five-passenger machine will be produced by the Winther Motor Co. during the coming season. It is equipped with a Herschell-Spillman 3¼ x 5 in. engine rated at 56 h.p., a Warner multiple disk clutch and transmission, shaft drive with Peters' universal joints and Spacke axles with taper roller bearings. Other equipment includes a Stromberg carburetor Westinghouse ignition, starting and lighting equipment, a Willard storage battery, Stewart vacuum feed system, Lavine worm and gear type gearing with Cincinnati drag link and 18 in. black walnut steering wheel. Cord tires, either Goodyear or Firestone, will be fitted all around, the dimensions being 33 x 4 in. The front tires have a ribbed tread and the rear a diamond tread. The wheel base is 120 in.

Mutual Truck Plans 10,000 Yearly Output

INDIANAPOLIS, May 9—A production program of 10,000 motor trucks annually, the peak to be reached in three years, is the program of the Mutual Truck Co. of Sullivan, Ind., which has increased its capitalization from $500,000 to $5,000,000, all common.

Without delay the present plant, which is 100 x 150 ft., is to be doubled. Architects' drawings for the proposed new plant have been prepared, showing building construction 750 x 400 ft.

The Mutual truck is wholly assembled, after the engineering ideas of Robert Petrie, the president. The truck under production is the 2 ton, but a 3½ ton and 5 ton are to be built later. The company is less than three years old.

HARVARD SCHOOL GETS PLANE

CAMBRIDGE, MASS., May 8—In order to get the school recently started by the Harvard Aeronautical Society under way as soon as possible, two air pilots, W. V. Daugherty and R. A. Griswold, both seniors in the college, left last night for Philadelphia to get the seaplane recently purchased and fly it to the Burgess company's hangar at Marblehead, where flying lessons will be given.

Packard to Spend $16,000,000 on Plant

Additions to Truck Shops Will Cost $2,000,000—Will Employ 15,000 Men

DETROIT, MICH., May 10—With buildings already covering an area one mile long and 1000 ft. wide Packard Motor Car Co. plans to expend more than $16,000,000 during the current year in factory additions and expansions that will permit of production to meet the rapidly increasing demand. Of this amount one-half represents new buildings and equipment and the other half increased inventories required by the larger manufacturing program. New buildings contemplated in the expansion plans prepared last year rapidly are nearing completion and will be in operation by July 1.

Maintaining Packard standards has necessitated the production of most of the parts for both passenger cars and trucks within the organization. Coupled with the complete manufacturing process the increased demand necessitates greater manufacturing facilities than are required in the average run of automotive vehicles in which assembling is a larger part of the industrial effort.

Extensions to the truck shops alone will require $2,000,000 of the building outlay, the 75 per cent increase in floor space devoted to truck production giving a total of 400,000 sq. ft. for machining and assembly operations.

In the main factory building 21,600 sq. ft. of courts have been covered with glass furnishing additional facilities for final work on Twin Six cars. A new four-story structure giving 118,214 sq. ft. of floor space occupies the site of the old Packard building, increasing the capacity of the hardening room, the sheet metal shop and the plating and polishing departments.

Foundry capacity has been increased by the addition of 39,701 sq. ft. and a fourth floor has been added to one of the foundry buildings as an enlargement to the pattern shop.

Installation of a Wellman-Seaver-Morgan crane for delivering pig iron from freight cars to a storage platform on a level with the cupolas expedites the handling of material and completes the up-to-date foundry equipment.

Follow Packard Standards

All of the new buildings are of the Packard standard type of reinforced concrete factory construction and carry out the general design developed during the past 15 years. Illumination with Cooper-Hewitt mercury lamps adds greatly to the productive effort throughout the plant.

The Packard organization of 10,000 will be increased to 15,000 as soon as the new buildings have been completed. Additions to the working force are being made now in the effort to build the organization for the opening of the new plant, and a full complement will soon be ready.

Tire Market Faces Serious Shortage

Scarcity of Long Staple Cotton and Transportation Delays Cut Cord Supply

NEW YORK, May 11—Reports from various sections that tire retailers were short of cords were confirmed here today by manufacturers who said that shortage of long staple cotton fabric, aggravated by transportation delays due to railroads strikes and congestion, had brought about a serious condition in the tire market. Despite heroic efforts to get raw material into Eastern cotton mills and to ship the fabric to the rubber manufacturing districts of the Middle West by truck, it was said that production had been seriously interfered with, and cord tires in particular would be short of demand this summer.

The peak of the shortage in cords is in the 34 by 4½ and the 35 by 5 inch sizes. Some dealers are inclined to blame some of the manufacturers for failure to augment production equipment for these sizes and for continuing to turn out less popular sizes in greater numbers than tire merchants could readily dispose of. Whatever the reason, the fact remains that after educating automobile owners to prefer cords to fabric construction, dealers are being forced more and more to fall back on fabrics to meet the demand for the popular sizes mentioned.

While some manufacturers profess to have sufficient sources of long cotton supply to meet their schedule production of cords provided transportation and cotton mill conditions are restored to normal, others admit that there will have to be more reliance this year than was originally planned on the short cotton staple, which meets the needs of fabric tire construction.

Reports from the New England textile districts say that a number of big cotton mills are on the verge of closing their doors, some because of inability to get raw materials over the railroads and others because their storage capacities are already overtaxed warehousing finished tire cotton which cannot be moved to the rubber factories.

The shipment of cotton from the mills to the rubber factories and transportation of finished tires back East by motor truck is already in progress on a large scale. One operation in this line involving a single tire producer is employing 200 five-ton trucks operating in relays of 20 each from New England.

General Motors Seeks British Plant Site

NEW YORK, May 13—Curiosity as to the significance of the recent election of Sir Harry McGowan and Arthur Chamberlain to the directorate of the General Motors Corp. was somewhat allayed to-day when it was learned that they had purchased large holdings of stock preliminary to an attempt at mass production of automobiles in England by the corporation. It is understood that negotiations are being conducted for the purchase of a site in England on which to build a plant for the production of motor cars on the lines followed in this country.

Sir Harry is chairman of the Board of Explosives, Ltd., and managing director of the Nobel Co. Chamberlain is chairman of Kynochs, Ltd. Reports of their investment in General Motors stock run as high as $25,000,000.

Mayo Radiator Loses in Infringement Suit

NEW YORK, May 12—Patent controversies that may involve several firms constructing honeycomb and cellular types of radiators were feared by manufacturers as a result of the adverse decision by the United States Circuit Court of Appeals here against the Mayo Radiator Co. of New Haven, Conn., in the infringement suit brought by the Whitlock Coil Radiator Co. of Hartford, Conn. A petition for a rehearing has been filed by the Mayo company, which is a subsidiary of the Marlin-Rockwell Corp.

The infringement suit was filed several months and in the lower courts resulted in a decision favoring the Mayo company. This, however, was appealed and the Whitlock concern, basing its allegation of infringement on a patent issued to Louis Herman Brinkman of West Hartford, was successful in the appellate body. The decision stated that Brinkman "stands at the head of a class and is entitled to a liberal range of equivalents" and the earlier decree was reversed "with directions to sustain the claims in suit and grant the usual interlocutory decree."

The Brinkman application was filed in 1903 and was issued as Patent No. 843,-864. It is based upon the use of a continuous strip of metal in forming the radiator, the material being bent into curved forms that provide the customary air and water spaces. This was said to be a departure from the methods in the original Mercedes radiator and, in view of the sweeping action of the Appeal Court, may involve several types of passenger car radiators.

RACINE TO BUILD TRACTORS

RACINE, WIS., May 11—The Racine Engineering Co. has been organized to devote its attention exclusively to the engineering of tractors and tractor implements. It also will manufacture tractors and tractor parts designed to be on a par with motor trucks and truck parts. The company was organized by L. N. Burns, formerly vice-president and sales manager of the J. I. Case Co.; A. Y. Dodge, formerly tractor designer and consulting engineer of the Wallis Tractor Co., and H. L. Taite, formerly assistant sales manager for the Case company. Offices have been established in the Badger building, Racine.

Duesenberg Buys Indianapolis Site

Production of 8-Cylinder Car to Sell at $6,000 Expected in Fall

NEW YORK, May 13—Duesenberg Automobile & Motors Co., Inc., a $5,000,-000 corporation, has been formed in Delaware, to manufacture automobiles. A factory site covering 16½ acres at Washington and Harding streets, Indianapolis, has been purchased and necessary buildings will be erected thereon as quickly as material can be assembled. The head office of the corporation will be in the Lemcke Building, Indianapolis, until such time as the factory and executive office buildings are completed.

An automobile to retail at approximately $6,000 will be built from the designs of Fred S. Duesenberg. The 8-cylinder Duesenberg engine will be used in this car, the same type of engine which Milton used at Ormond Beach, Florida, recently.

Production of the new Duesenberg is expected to commence late this fall and to be in full swing for the 1921 selling season.

PARRETT TO MAKE TRUCK

CHICAGO, May 8—The Parrett Tractor Co., which recently was reorganized with Vincent Bendix as president, soon will produce a motor truck of about 1-ton capacity for both city and farm purposes, and a light tractor cultivator. It also will make a new and powerful three-plow tractor with a specially designed 4-cylinder, 4½ x 6 engine with overhead valves, designed to deliver 15 hp. at the draw bar or 30 at the belt. Its list price is $1,950. The truck will list around $1,750 and it is planned to produce 2400 the first year. The cultivator lists at $1,000 and the schedule calls for 1800 the first year.

Tractor sales will be in charge of E. F. Sanders, who has been with the company for some time. Herbert L. Scharlach, former sales manager of the Sterling Motor Truck Co., Milwaukee, and more recently with the Republic Motor Truck Co., will look after sales of the truck.

TURNER ADDS TWO UNITS

PORT WASHINGTON, WIS., May 10—The Turner Mfg. Co., Port Washington, Wis., manufacturer of Simplicity gas engines and tractors, will build a brick and steel foundry addition, 60 x 160 ft., and a machine shop addition, 40 x 90 ft.

HAYES INCREASES CAPITAL

DETROIT, May 8—Hayes Wheel Co. has increased its capital from $2,000,000 to $7,500,000 of $10 common stock and has authorized a 50 per cent stock dividend to shareholders of record May 20. A portion of the increased stock will be put on the market by directors under authorization of stockholders.

Government Finds Gas Shortage Near

Bureau of Mines Serves Notice of Imminent Scarcity—Must Develop Sources

WASHINGTON, May 13—Notice has been served on the nation that a shortage of gasoline and oil fuels is imminent. The Bureau of Mines, Department of the Interior, points out that little hope can be held out for increased output of liquid fuel. They urge upon the country that "petroleum and its products should be reserved for those uses for which it is peculiarly adapted and for which there are no substitutes."

Director Cottrell sets the facts before the country in a statement in which he says:

"The consumption of all petroleum products has increased at an enormous rate. During 1918 comparatively few automobiles were built and there was not as great an increase in the automobiles in use in 1918 and 1919 as in previous years. But in 1919 1,500,000 automobiles were built which will be in use during 1920 while the automotive industry is more active than ever before. It is therefore to be anticipated that 1920 will prove to be a year of enormous consumption of gasoline.

"The demand for kerosene continues to be active and the price of kerosene has doubled in a little over a year's time. The price of fuel oil has also doubled.

"The United States Geological Survey has estimated that over 40 per cent of the oil in all the oil fields has been brought to the surface and used, and it is estimated that the underground reserve is equal to less than twenty years of the present consumption demands.

"In general it may be stated that the oil from the wells of the United States, in all probability, cannot take care of our future needs, but that there is much oil in the world, and it simply is a question of developing it with sufficient rapidity to keep pace with the rapidly increasing demands.

"Oil products can also be obtained by destructive distillation of coal, and lignites. However, if all the coal and lignites mined in the United States were subjected to destructive distillation, this would provide but a comparatively small fraction of our petroleum needs.

Shales Source of Supply

"The oil shales of the United States, particularly those of the Rocky Mountain districts, contain potential quantities of oil in beds which are richer than those of Scotland, where shale has been retorted for many years. These shales are capable of yielding many times greater quantities of hydrocarbons than have ever been extracted in all the oil fields of the world, according to the estimates of the Geological Survey.

"But this industry is in its infancy. In fact, it has not yet passed out of the experimental stages. It will take enormous capital, enormous equipment, and enormous energy to develop the oil shales to such a point that they can supply any considerable quantity of our oil needs. Almost as much, if not more, tons of oil shale would have to be mined than coal in order to obtain production of crude oil equal to the present yield of our oil wells. It must, therefore, be many years before this resource can be used to supplant our failing oil fields.

"The time has arrived when with crude oil higher than it has been for fifty years inefficiency in the production and manufacture of petroleum should not be countenanced."

British Extract Vegetable Alcohol

LONDON, April 24—(*Special Correspondence*).—In view of the scarcity and high price of petrol, says the American Chamber of Commerce in London, the British Government has commenced an important series of experiments with a view to discovering an efficient substitute.

Extensive new laboratories are being provided with a special staff of assistants, and investigations are at present being made into the possibilities of power alcohol, since it is believed that this can be used in place of petrol.

Experiments in extracting power alcohol from a number of vegetable substances have already been made, says the American Chamber, and it is said to be clear that the power alcohol can be produced far more cheaply than the present selling price of petrol.

APPROPRIATION HELD OVER

WASHINGTON, May 8—Recommendations of the Senate Committee on Postoffices and Post Roads for the creation of a Federal Highway Commission will be submitted to the Senate within a few days. Senator Townsend, chairman, has announced that the committee has agreed not to ask the present Congress for the appropriations necessary to construct a national highway system. Instead, they believe it advisable to appoint a commission, along the lines proposed in the bill introduced by the chairman in December. They also propose to consolidate the Bureau of Roads with this new commission.

HOLDS BUS LINES ILLEGAL

NEW YORK, May 11—The Appellate Division of the State Supreme Court has handed down a decision unanimously affirming the decision of the lower branch that operation of existing bus lines in competition with surface electric lines is illegal. The court holds that the city has the right to grant a franchise to any company operating a bus line if it first obtains a certificate of necessity and convenience from the Public Service Commission, but such certificates undoubtedly would be refused except with the express stipulation that they would not compete with existing trolley lines.

Reserve Officials to Class Luxuries

Adoption of Rigid Economy Plan for Entire Country Expected Outcome

WASHINGTON, May 12—Further curtailment of credit for the purchase of commodities classed as luxuries will be considered at a conference here Monday of governors of Federal Reserve banks. Prominent bankers from all parts of the country will be called into the council, and it is highly probable a new and more rigid policy will be adopted for the entire country. Financial reconstruction measures designed to bring the nation back to normal financially and economically will be considered.

In an interview to-day with a representative of AUTOMOTIVE INDUSTRIES it was asserted by W. P. G. Harding, governor of the Federal Reserve Board, that there was no basis to the report that confidential instructions would be issued to restrict the volume of credit on passenger automobiles.

The Federal Reserve Board would not undertake to issue such orders on the basis of passenger cars being a non-essential, Governor Harding said, because the act under which it operates does not provide this power with the cessation of hostilities. There is nothing in the act, however, the official declared, which requires the Federal Reserve Bank to discount any paper.

The governor made no claim that the subject of automobile loans would not be thoroughly discussed at the conference here Monday. He pointed out that all vital subjects are up for consideration in the group meetings. The opinion prevails, however, that the present plan of leaving the matter of class loans to the discretion of individual Federal Reserve banks will continue until the transition stage is successfully passed.

It was the personal opinion of the governor that the demand for loans would be appreciably diminished as the shortage of gasoline supplies becomes more evident. There are many financiers throughout the country who seem to take this same view—that demand for passenger cars will drop as fuel costs advance.

This assumption is apparently based on the belief that prospective purchasers of automobiles who are obliged to borrow would be less liable to require loans while operation costs mounted. The note of alarm sounded by the Bureau of Mines in its survey of the gasoline situation gives the financiers more confidence in expressing their views on these related subjects.

ACE BUYS SAVAGE FACTORY

PHILADELPHIA, May 10—The Ace Motor Corp., devoted to the manufacture of motorcycles, has taken over the large plant at Erie Avenue and Sepviva Street, formerly used by the Savage Arms Co., and plans to turn out 10,000 finished Ace motorcycles before Jan. 1.

Shipments by Water Relieve Rail Tangle

Cincinnati Gets 490 Cars by Barge — Milwaukee Gets Shipments by Boat

LOUISVILLE, May 10—Barges containing a cargo of 490 automobiles, towed by the steamer Sprague, passed through the canal at 1 o'clock yesterday afternoon on the way to Cincinnati. Rivermen hailed the event as an omen of the revival of river traffic. The Sprague left St. Louis Sunday morning with its unusual cargo; due at Cincinnati to-day.

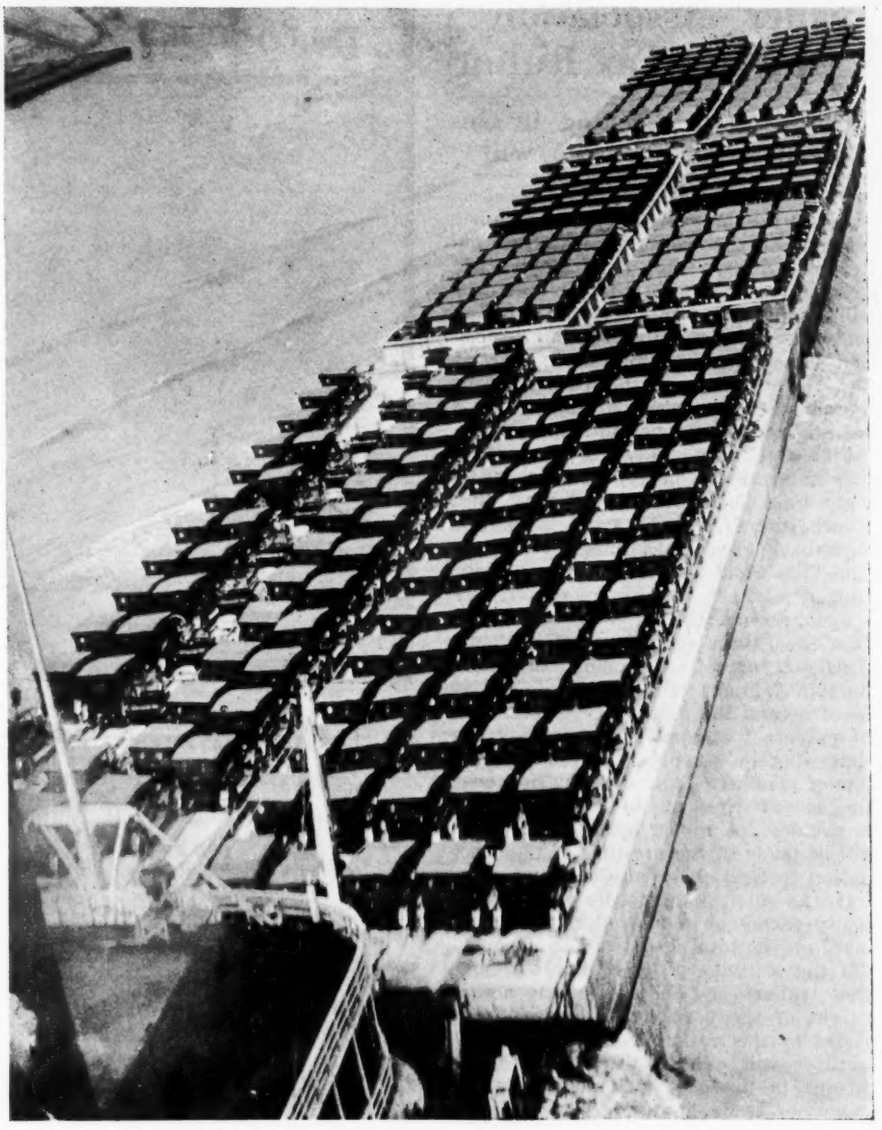
The cars were shipped by water because it is cheaper, faster and because the car shortage is acute, members of the crew asserted. It is estimated that it would have required more than 100 railroad cars to handle the shipment.

The boat will pick up a cargo of 400 automobiles at Cincinnati for shipment to Memphis and return to St. Louis for another consignment. The automobiles in the Sprague's tow are Chevrolets.

Milwaukee Ships by Lake

MILWAUKEE, WIS., May 10—The opening of navigation on the Great Lakes has made it possible for factories located at Cleveland, Toledo and Detroit to make some shipments of passenger cars by boat to Milwaukee, for distribution in Wisconsin, Minnesota and Upper Michigan. A saving of not less than two days in time of delivery is effected thereby.

The steamer Lakeland of the Tri-State Steamboat Co. of Cleveland has arrived at Milwaukee with her first cargo of passenger cars for Milwaukee and Minneapolis distributers. This boat has been converted for motor vehicle transportation, having a crane and extra deck. It will make regular trips to Milwaukee and Chicago. As cargo space is released by unloading at Milwaukee, the boat takes on cars and parts here and at Kenosha and Racine, for the lower lake ports, going to Chicago to unload cars and returning to Racine and Kenosha for the rest of the eastbound cargo.



The Sprague Pushing 490 Automobiles

Goodyear to Establish Dirigible Freight Line

AKRON, May 10—The movement to establish America's first dirigible air line for the purpose of carrying mail, freight, passengers and express has been given further impetus in the announcement by the Goodyear Tire & Rubber Co. that it had purchased from the United States government a 320,000 cu. ft. airship of the Chalais-Meudon type, built in France for the United States navy.

The huge ship will arrive in America in a few weeks to be assembled at Wingfoot Lake aviation station near Akron, and will immediately be put in service.

Daily trips are planned on a 150-mile air line route between Akron and Detroit in the fall. The ship has a capacity of 30 passengers on short trips. No passengers will be carried during the first month of operation, it being the intention to develop the mail, express and freight end of dirigible transportation for the purpose of determining schedules, runs and costs.

The envelope or bag of the ship is 260 ft. long. The cabin enclosed for protection against the weather is 45 ft. long. Twin motors of 250 hp. each develop a speed of 55 miles an hour.

HALL HEADS COMMITTEE

NEW YORK, May 11—F. W. Hall, commercial manager of the Sprague Electric Works, has been appointed chairman of the Engineering Committee of the Material Handling Machinery Manufacturers Association. Six sub-committees will consider the following subjects: Cranes, hoists and winches; gravity and power conveyors; elevators; industrial trucks; bulk handling machinery; miscellaneous equipment. One member of each sub-committee will serve with Hall on the main committee.

Hunter Motor Buys Pennsylvania Site

HARRISBURG, PA., May 10—The Hunter Motor Car Co., chartered by the State some time ago with $1,000,000 capital stock, has announced through its president, C. H. Hunter, that it has purchased twenty-one acres at White Hill, on the Gettysburg Pike, with railroad siding connections on both the Philadelphia & Reading and the Cumberland Valley roads, as a site for a factory.

The land purchased is to be paid for in stock of the company at par and $40,000 already has been subscribed in cash, it is announced. The company has been in process of formation for the last year and its policies have been well worked out. The company will make a high grade, moderate priced automobile, the cars to be sold direct to the owner through the company's branch offices which are to be established.

Trailer Association Opposes Tax Ruling

Parts of Truck Rating by Internal Revenue Bureau Will Be Contested

DETROIT, May 8—Efforts to obtain a revision of the ruling by the Internal Revenue Bureau that semi-trailers are taxable as parts of automobile trucks will be made by the Trailer Manufacturers Association. Failing, the association plans to take the matter to court to test the validity of the ruling. This course of action was determined at a meeting of the association this week.

Five new members were admitted to the roster, these being, Lee Loader & Body Co., Chicago; F. P. Lyons, Inc., Manchester, N. H.; E. & W. Mfg. Co., Milwaukee; Byron Engineering Works, Louisville, and Lapeer Trailer Corp., Lapeer, Mich.

Speakers at the meeting were Col. Charles Clifton, president of the National Automobile Chamber of Commerce; William E. Metzger, Walter Wardrop and D. C. Fenner. A committee on patents was appointed to prepare a plan whereby possible future litigation among members of the association over alleged infringement of patents might be avoided. A report by this committee will be made at the meeting of the association in September at Cleveland.

It was voted unanimously that the capacity rating of semi-trailers should be based on the total load to be transported and the capacity of pole, pipe and logging trailers or "dollies" on the actual weight of the portion of the load supported by the trailer itself. Each manufacturer will explain these methods of ratings in his advertisements, catalogs and other trade literature to avoid confusion on the part of purchasers.

"Truck by Trailer" was adopted as the slogan to be used by the entire industry and a distinctive design embodying the slogan is to be prepared.

Fisk Rubber to Locate Offices in New York

NEW YORK, May 10 — Designed as the permanent home of the Fisk Rubber Co.'s executive offices, a $5,000,000 office building of 25 stories will be erected at Broadway, Fifty-seventh Street and Eighth Avenue. It is announced that the erection of the building will bring about no changes in the administration of the company or in the official staff at the factory at Chicopee Falls, Mass., which is to remain as at present with the sales and administrative departments housed in the factory office building.

The building here will be made one of the finest office structures in the city, facing Central Park. Work will be started immediately, but because of certain leases it is probable the building will not be completed for more than a year.

The Late C. H. Gurnett

C. H. Gurnett Dies Following Operation

CHICAGO, May 11—C. H. Gurnett, Western advertising representative for The Class Journal Co., died here early to-day at the Englewood Union Hospital from complications resulting from an operation for acute appendicitis undergone about a fortnight ago. Gurnett was one of the most widely known advertising men connected with the automotive industries, having been associated with such work almost his entire lifetime.

Mr. Gurnett was born in Ingersoll, Ont., on July 24, 1866. He came to Chicago when he was only sixteen years old and went from door to door in the business district until he obtained his first position with the A. F. Barnes Co., book publishers. He remained with the Barnes company until its merger with the American Book Co. and continued with the latter concern until 1901.

In 1901 Mr. Gurnett purchased an interest in the *Automobile Review* and continued as part owner and publisher of that publication until 1903 when he became associated with *The Automobile*, the first of the automotive publications owned by The Class Journal Co. When *Motor Age* and *Motor World* were purchased by The Class Journal Co., Mr. Gurnett was appointed Western advertising manager for the entire group of publications, a position he retained until his death.

Mr. Gurnett in 1890 married Miss Ada Lee, two children, Gwendolyn and Marjorie, surviving from this marriage. In 1906 he married Miss Ruby Ratcliffe of Waukon, Iowa, who survives him, and has had four children by this marriage, Ruth, 12; Alice, 9; Charles H., Jr., 8; and Robert, 6. Private funeral services will be held Thursday from his late residence, 7215 Princeton Avenue.

Labor Government Coming in England

Major Wrench Predicts Workers Will Rule—Describes Guild Socialism

NEW YORK, May 11—Prediction that there would be a labor government in England within five or six years was made last night by Major Evelyn Wrench, head of the British bureau of information in London during the war, in an address at a dinner given in his honor by the New York Business Publishers' Association. It was Major Wrench who piloted the delegation of American publishers of business papers who went abroad while the war was raging and the men who became acquainted with him then were eager to return some of his hospitality.

Major Wrench, who is in the United States in the interest of the English Speaking Union, said that moderate labor is in the ascendancy now in England and that it is led by level-headed men of the type of Arthur Henderson, who was a member of the war-time coalition cabinet. Labor as a whole, he said, is satisfied that sooner or later it will elect a majority of the members of the House of Commons. He did not take a gloomy view of the future, he added, because it has been demonstrated in some of the British dominions that when labor gets into power it realizes its responsibilities and governs its actions accordingly.

The growth of Guild socialism is one of the striking developments in England, Major Wrench stated. This socialistic movement recognizes three elements of the population—the hand worker, the brain worker or technician, and the consumer. The present day capitalist must shift for himself under this program. It is regarded as inevitable, Major Wrench said, that in the not distant future the state will take over the British mines and railroads.

The "terribly difficult" Irish situation was sketched briefly by the Major. He said the chief reason for opposition to letting the Island become a Republic was strategic and he pointed out what would have happened in the war if there had been next door to England a little state on the side of her enemies.

Pleads for Better Understanding

Major Wrench made an earnest plea for a better understanding between the people of England and the United States. He did not believe trade rivalry should engender jealousy for there is trade enough for both nations. He emphasized the importance of close co-operation between the two greatest business nations at a time when the economic structure of civilization has broken down and the world is menaced by Bolshevism.

Major Wrench was introduced by H. M. Swetland. Other speakers were Arthur J. Baldwin of the McGraw-Hill Co., who was in Berlin during the Kapp revolution, Samuel Dunn and Roger Allen.

INDUSTRIAL NOTES

Covert Gear Co., Inc., will centralize all its departments, including sales, service and engineering, at its factory headquarters at Lockport, N. Y., where recent factory additions will allow them to be adequately housed and equipped. R. C. Merchant, sales manager, moved his headquarters from Detroit to Lockport several weeks ago. The Detroit office will be continued in its present location.

O. E. Szekely Co., mechanical and automotive engineers, has removed from Rock Island to larger quarters at 1516 Fourth Avenue, Moline, Ill. The experimental station has been enlarged and equipped with precision tools of universal type. The company will install a Riehle testing machine, a Diehl electric as well as a hydrostatic dynamometer and various kinds of instruments.

Carborundum Co., Niagara Falls, N. Y., has acquired from the alien property custodian the plant formerly owned and operated by the Didier-March Co. at Perth Amboy, N. J. The plant will be taken over at once and converted to the manufacture of a complete line of carborundum refractories for use in high temperature furnace work.

Rex Machine Co., Chicago, makers of Wizard power driven tire pumps, has changed its name to the Sundstrom Mfg. Co., and increased its capital to $100,000, all of which has been paid in. New machinery has been installed to permit increased production. The management of the company has not been changed in any way.

Davis-Bournonville Co., Jersey City, manufacturers of oxy-acetylene and oxy-hydrogen welding and cutting apparatus, will move its Canadian plant from Niagara Falls to Toronto in June. The Toronto sales office will be moved from its present location to the new factory at 32-34 Eastern Avenue.

Mackinnon Mfg. Co., Grand Rapids, has started operations in its hub and spoke mill at Rice Lake, Wis. Additional production is necessary to fill orders from the automotive industries for spokes, felloes and other materials. The mill is in the heart of a hardwood timber district.

Gary Auto Body Mfg. Co., East Gary, Ind., recently incorporated, has purchased a 5-acre tract, and when its plant is completed will have a floor area of 375,000 sq. ft. The first unit is expected to be ready about July 1. The company will specialize in manufacture of sedan bodies.

Hartford Automotive Parts Co.—Reports indications that sales for 1920 will exceed $2,000,000, as compared with $1,241,938 last year, when net profits were $156,718 after payment of preferred dividends, equivalent to $9.71 a share on the common.

Vreeland Motor Co., Newark, N. J., manufacturers of motor trucks, is receiving bids for the erection of a new plant at Irvington at an estimated cost of $350,000. The initial works will include several large one and two story buildings.

Lapeer Tractor-Truck Co., Lapeer, Mich., has changed its name to the Lapeer Trailer Co. It has discontinued the manufacture of tractors and will confine itself exclusively in the future to trailers.

Evinrude Motor Co., Milwaukee, makers of outboard engines for rowboats and canoes, has started work on the first unit of its new plant which will provide 75,000 ft. of floor space.

Hercules Rubber Corp., a $1,000,000 Cincinnati company, is preparing to erect a factory for the manufacture of an automobile tire with a newly patented airless truss tube.

Splitex Radiator Co., Racine, Wis., is contemplating removal of its plant to Baraboo, Wis., where local capital has taken a large part of a recent $1,000,000 increase in capital.

Wohlrab Gear Co., Racine, Wis., specializing in automotive parts, has increased its capacity fourfold by taking over the former plant of the Schartow Mfg. Co.

Milwaukee Stamping Co. will further extend its plant during the summer. The capital recently was increased from $250,000 to $500,000.

Midwest Engine Co. has appointed dealers in all the larger cities throughout the country to stimulate sales of the Midwest utilitor.

N. I. V. A. Announces Show Regulations

CHICAGO, May 10—Revised rules governing tractor shows and demonstrations have been issued by the National Implement and Vehicle Association. One of the rules says the show and demonstration committee "will take no cognizance of any show which is purely local in character as defined by the rules and in which the exhibitors are limited to bona fide dealers resident in the territory tributary to the town where the show is held."

Demonstrations of tractors in conjunction with road-making exhibitions will be considered the same as a public field exhibition. A combination plowing and road-making demonstration will be recognized by the committee.

Dealers' schools are sanctioned and one who confines his demonstration or school to those makes of tractors handled will not be considered a violator of the rules. The committee will not, however, approve any shows of tractors or tractor drawn or driven machinery, held in connection with or under the auspices of retail dealers' associations or threshermen's associations.

The association is now at work gathering production figures. Accurate reports are not yet available, but it is estimated that the number of tractors now in use is 250,000 with a probable production of 175,000 for 1920. It is calculated the average tractor is used from 50 to 60 days each year and that the average fuel consumption is about 1200 gal., about three-quarters of which is kerosene.

YALE WINS AVIATION MEET

MINEOLA, N. Y., May 8—The first intercollegiate air meet was held here to-day at Mitchell Field. Eleven colleges were represented. The machines and supplies were furnished by the Army Air Service and only reserve officers were allowed to compete. There were four events: 25-mile cross country, acrobatics, "alert" and landing to a mark. Yale won the meet with 9 points, Williams was second with 6, Columbia and Princeton were tied for third place with 5 each. Approximately 5000 persons witnessed the events.

METAL MARKETS

Pig Iron.—Amid the out-of-joint conditions that followed in the wake of the railroad tie-up, pig iron producers and marketers are disposed to minimize the obvious improvement in output. Furnace operations appear to be 80 per cent normal. Pittsburgh and Buffalo district furnaces are rapidly recovering their normal stride while those farther west in the Chicago, Cleveland and Youngstown territory, which were hit hardest, are having a correspondingly more difficult time of it. Notwithstanding the claim of certain producers that the pig iron market is like a restaurant which is so nearly sold out that the guests no longer order from the bill of fare but are glad to take what is set before them, it looks very much as though the diminution in consumption had kept pace with the reduction in output.

Iron and Steel.—The market is rapidly adjusting itself to the levels of the U. S. Steel Corporation. Merchant steel bars which, a few weeks ago, were unobtainable from independents at below 4c., are reported to have been sold for delivery in a few months at 2.45c. Sheet bars have been rushed to sheet mills in heavy tonnages and the output of sheets has increased from day to day.

Aluminum.—The market is quotably unaltered and firm. Attempts by resellers to induce automotive plants that have had to curtail or suspend operations temporarily, to part with some of their aluminum reserves, failed. Virgin ingots, 98 to 99 per cent pure, command 33c. from the sole producer.

Copper—The best bid which the Navy Department received for 1,000,000 pounds of electrolytic, was below 18¼c. and all bids have been rejected. Save for export, the copper market continues to be a talkfest, with producers quoting 19¼@19½c., but much resale metal was offered at 18½@18⅝c. The undigested surplus continues to be estimated by authorities at 500,000,000 pounds.

Tin.—Downward readjustment of the tin market has been continuous. A week ago buyers considered that with a recession in the price of Straits tin to around 60c., the market had become fairly safe for placing orders for deferred deliveries. Since then values have eased off further to the extent of about 5 per cent, Straits being quoted at 56½@57c. and Lamb and Flag and No. 1 Chinese 1@1¼c. below that level.

Lead—The American Smelting and Refining Company has lowered its official quotation $15 a ton to 8.50c., New York, and 8.25c., East St. Louis basis.

Zinc.—The market is flat and neglected by consumers with Prime Western offered at around 7⅞c., East St. Louis basis.

Brass.—Although labor disturbances are by no means over in the Connecticut brass valley, the mills are gradually recovering and output is on the increase. The Rome, N. Y., mills are operating.

Automotive Financial Notes

Timken-Detroit Axle Co.—Declared regular dividend of 4 per cent for March and April and an extra dividend of 2 per cent. Action on the contemplated stock dividends was deferred pending disposal by Congress of proposed legislation taxing war profits for soldier bonuses. The company had $10,175,579 in surplus account, and $2,993,000 of common stock outstanding as of Dec. 31.

Packard Motor Car Co.—Officials refused to confirm report that a note issue between $10,000,000 and $15,000,000 is contemplated. Reports that the issue would be used to take up $5,000,000 in notes issued in 1916 developed the information that funds to retire these notes had been provided by the sale of preferred stock last year.

Stutz Motor Car Co.—Stockholders have authorized increase in capitalization from 120,000 shares of no par value stock to 200,000 shares. The amount of capital with which the company will carry on its business is increased from $600,000 to $1,000,000. The new stock will be paid out in stock dividends.

Chandler Motor Car Co.—Directors voted a stock dividend of 33⅓ per cent payable June 1. Directors feel present dividend rate of $10 a share can be maintained on the increased capital. Shipments during first four months of this year were 3½ times as large as in the same peroid of 1919.

Hayes Wheel Co.—Directors have decided to increase capital from $2,000,000 to $7,500,000 and to declare a 50 per cent stock dividend. It is proposed to sell 150,000 shares of the new stock to acquire the common stock of the Pioneer Pole & Shaft Co. and to increase working capital.

Hupp Motor Car Corp.—Net profits expected to exceed $3,000,000 for the twelve months ending June 30, after charges and Federal taxes. The balance, after preferred dividends, would be equal to more than $5.50 a share on the 519,210 shares of common stock of $10 par value.

Doehler Die-Casting Co.—Has sold $1,000,000 of 7 per cent serial gold debentures to the Harris Trust & Savings Bank, Chicago. The company's net sales have increased from $2,000,000 to $6,450,000 in five years.

Stewart-Warner Speedometer Co.—Capital increased by 200,000 shares of common of no par value of which 60,000 will be exchanged, share for share, for stock of Stewart Mfg. Corp., and remainder held in treasury.

Detroit Pressed Steel Co.—Report to Detroit Stock Exchange lists total assets of $5,121,960.32 Dec. 31, with current assets of $2,036,691.97, and current liabilities $442,433.86.

International Motor Truck Co.—Reports a balance for quarter ending March 31 of $968,057 on a production of 1870 trucks. The recently acquired New Brunswick plant is now getting into production.

Medina Manufacturing Co., Medina, Ohio, successor to the Medina Machine Co., has increased its capital stock from $75,000 to $1,000,000 to triple the capacity of the plant.

Automotive Rebuilding Corp.—Organized at Columbus, O., with capital of $100,000, to rebuild passenger cars and trucks, has taken over former plant of Monitor Motor Car Co.

Rotary Tire & Rubber Co., Zanesville, O.—Stockholders have authorized increase of capital from $800,000 to $2,000,000 to increase business and enlarge factory.

New England Co., West Canaan, Conn.—Incorporated with $300,000 capital to manufacture automobile bodies in plant of Canaan Lumber Co., which it has bought.

Ajax Rubber Co.—Officially reported business this year will exceed $35,000,000 unless something of an unexpected character develops to upset calculations.

J. W. Murray Mfg. Co.—Reports net profits as of Dec. 31 of $243,520, after providing for Federal taxes. Total assets were $2,059,773.20 and surplus $323,764.

Cleveland Automobile Co.—Reports that in the first eight months of operation it produced 7500 cars with the participation of only $1,400,000 outside capital.

Allen Motor Co. of Columbus is planning the issuance of $380,000 of first preferred stock, $150,000 second preferred, and $300,000 in common stock.

American Automobile Accessories Co.—Has purchased two new buildings in vicinity of its plant and will spend $150,000 in remodeling them.

Globe Seamless Tubes Co., Milwaukee.—Capital increased from $600,000 to $1,000,000 to provide funds for expansion of business.

Cadenhead Auto Rim Co., Birmingham, Ala.—Organized with $300,000 capital to make a patented auto rim.

The Whitney Tractor Co., incorporated for $1,000,000, has taken over the former plant of the Ohio Manufacturing Co.

Gearless Tractor Co., Atlantic City.—Incorporated at $3,000,000 to make motor-driven tractors.

Cincinnati Gear Co.—Increased capital from $33,000 to $300,000 to care for increased business.

Daniels Heads New Motors Organization

PHILADELPHIA, May 10—The Daniels Motor Co. has taken over the Daniels Motor Car Co. and the Keystone Vehicle Co. George E. Daniels, president of the Daniels Motor Car Co., is president of the Daniels Motor Co. Neff E. Parish, vice-president of the Parish Manufacturing Corp., is vice-president of the new concern. Warren Davis is secretary and treasurer. Daniels formerly was with the General Motors Co. and vice-president and general manager of the Oakland Motor Car Co.

The new company will increase the production of the Daniels car to 1500 next year. Plans have been prepared for a model plant and office building at Huntingdon Park Avenue, this city. Work already has been started for an addition to the Keystone vehicle body works in Reading, Pa. The entire output of the company for 1921 has been contracted for. The new Reading building will be 62x116 ft. and cost $40,000.

PAN MOTORS CORRECTION

NEW YORK, May 10—In a recent story in AUTOMOTIVE INDUSTRIES the impression was given that Pan Motor Co. of St. Cloud, Minn., had been prohibited from selling any of its new $2,000,000 preferred stock issue in Minnesota. This is erroneous. The State license for the sale of common stock was revoked a year ago but the company is permitted to sell in that State preferred stock, of which the new issue is composed entirely. Pan Motor Co. is now operating on a monthly schedule of sixty cars, which will be continued until enough material is received to launch a 3000 annual schedule.

Bank Credits

Written exclusively for AUTOMOTIVE INDUSTRIES *by the Guaranty Trust Co, second largest bank in America.*

During the last week there have been clear evidences of a slight easing of the general credit situation. It must be borne in mind, however, that in the industrial situation it is the demand factor which is changing while the supply and distribution factors remain practically the same. Strikes of one sort or another or their effects still impede production and will continue to do so.

Insufficiency of rolling stock has still further disorganized transportation. In the credit situation, too, inelasticity of supply is the dominant factor and any diminution in the tightness that prevails must come from liquidation through better movements of goods. Over-optimism, therefore, is as dangerous as undue pessimism.

The Federal Reserve system in its report on Saturday showed a decreased volume of bills on hand and a decline in the figure for member banks' deposits, and at the same time, significantly enough, the New York Reserve Bank reported that its rediscount for other Reserve Banks had declined by $28,000,000.

Its gold holdings increased by about $25,000,000, presumably as a reflection of this drop in rediscounts. The Kansas City Reserve Bank, meanwhile, has been moved to modify its system of progressive discount rates, after the early experience with it had brought a realization of the complications and difficulties involved in its application.

Planes Successful in Commercial Flight

NEW YORK, May 12—With their front cockpits filled with merchandise, two Curtiss motored Standard J-1 airplanes which took off from Roosevelt Field at Mineola late Wednesday, arrived at Minneapolis Monday evening after a stop of 30 hours at Buffalo because of adverse weather conditions. The pilots were R. S. Miller and Charles S. Keyes, members of the Curtiss-Northwest Airplane Co.

REPUBLIC OFFERS ESSAY PRIZE

NEW YORK, May 13—The Republic Truck Sales Corp., Alma, Mich., has offered a $1,000 university scholarship for the best original essay prepared by a high school student in which the subjects of motor trucks and good roads are presented in such a way as to show their close relationship to the public welfare.

Men of the Industry

DeWitt V. D. Reiley, formerly vice-president of the Davis-Bournonville Co., Jersey City, was elected president at a recent meeting of the directors, succeeding Augustine Davis, who resigned last November. Charles B. Wortham, treasurer of the company since its organization, was elected vice-president, and William G. McCune, secretary and treasurer. The directors are DeWitt V. D. Reiley, Charles B. Wortham, William G. McCune, Augustine Davis, Charles J. Mayer, Daniel Evarts and H. Rowntree.

I. C. Lamb has been appointed sales manager of the Automatic Light Co., Inc., of Ludington, Mich., makers of the Holt power light unit. He formerly was a member of the sales staff of the General Electric Co., where he specialized in fractional horsepower motors. His earlier connections were the Western Electric and Westinghouse Electric companies.

Morgan Harding, formerly sales manager for the Aluminum Manufacturers, Inc., has purchased an interest in the Coe-Stapley Manufacturing Co. of West Haven, Conn. Harding who made many friends in Detroit while with the Aluminum company, will devote his entire time to the management of sales and development work in his new connection.

Russell S. Tucker was elected president of the General Tractors, Inc., at the annual stockholders meeting here this week. D. V. Holcomb was elected vice-president, C. D. Inman, secretary, and M. W. Hornbeck, assistant secretary and treasurer.

George Feher has been appointed assistant sales manager of the Moto-Meter Co. He formerly was in the sales organization of the National Carbon Co. S. J. Green has been made manager of the Northwestern territory for the same company.

J. Frank Brown, formerly with Berry Brothers, has become associated with the Hilo Varnish Corp. and will make his headquarters in Pittsburgh where he will look after a special class of trade in the industrial field.

Charles B. Morse, recently advertising manager for the Packard Motor Car Co. of New York, is general advertising manager for Hare's Motors, Inc., 16 West Sixty-first Street, New York, vice John A. Kingman, resigned.

G. M. Knowles has been appointed southern division sales manager for the Sanford Motor Truck Co., with headquarters at Baltimore. He formerly was connected with the Packard and A. L. Englander companies.

K. D. Smith, formerly with the Miller Rubber Co., has been made factory superintendent of the Syracuse Rubber Co., Inc. He has served eleven years in the chemical and manufacturing ends of the tire business.

Bevan P. Y. Jordan has resigned as general manager for William T. Taylor, Eastern distributer of Apperson motor cars, effective May 8. He will announce his future plans after an extended vacation.

J. Lee Barrett, secretary and treasurer of the Detroit Convention and Tourists' Bureau, has tendered his resignation to become connected with the Wood Hydraulic Hoist & Body Co.

J. C. Hooper, of the sales engineering department of the Cincinnati Ball Crank Co., has joined the sales organization of the Oakes Co., Indianapolis, makers of radiator cooling fans.

James E. Baird, advertising manager of the General Motors Truck Co., and **W. B. Hall** of the Green, Fulton, Cunningham Co., are making a survey of the mid-west farming section.

O. E. Truesdell has been appointed manufacturers' representative of the Firestone Steel Products Co., Akron, for the Ohio and Indiana territory with headquarters at Indianapolis.

Millard S. Binney has been made publicity manager of the Traffic Motor Truck Corp. Since the war he has been manager of the Omaha branch of the Fulton Motor Truck Co.

Oscar Mautner, for several years secretary and assistant treasurer of the Duplex Engine Governor Co., Inc., Brooklyn, has been elected secretary and general manager.

Ralph B. Dort, supervisor of foreign accounts of the Dort Motor Car Co., has left on an eighteen months trip to the Orient, Australia and Africa.

R. E. Werner, service manager, and **J. W. McClelland,** welfare manager of the C. R. Wilson Body Co., have resigned from that organization.

E. M. Hoagland, formerly Western district manager for the Amazon Rubber Co., has gone with the Malay Rubber Co., Cleveland.

Stanley B. Chamberlain left this week for a trip to Singapore, Yokohama, Manila and Hongkong in behalf of the Fisk Rubber Co.

F. R. Ryan has been appointed manager of the Chicago office of the Roller-Smith Co., New York, makers of electrical instruments.

C. R. Miller, formerly of Willys-Overland Co., Toledo, has been made production manager of Allan Motor Co., Fostoria, O.

E. A. Samuels has been made assistant sales manager of the Four-Wheel-Drive Co., Clintonville, Wis.

Robert E. MacKenzie has been appointed advertising manager of the Timken Roller Bearing Co.

S. A. E. Adopts Program for Summer Meeting

NEW YORK, May 12—The tentative program prepared for the summer meeting of the Society of Automotive Engineers provides for four general sessions. Tuesday, June 22, will be devoted to fuel, with C. F. Kettering presiding; Wednesday to transportation, with J. G. Vincent presiding; Thursday to farm power, with E. A. Johnston presiding, and Friday to production. The tentative program in detail follows:

Fuel session: "Gas Engine Power Fuel Economy," Dr. H. C. Dickinson; Report of S. A. E. Fuel Committee, H. L. Horning; Symposium, "Engine Design for Maximum Power and Economy of Fuel," C. A. Norman and H. M. Crane; "Fuel Tests Using High-Speed Indicators," P. S. Tice.

Transportation session: "Highway Transportation," G. A. Green; "Proposed Work of S. A. E. Transportation Committee," F. W. Davis.

Farm power session: "Analysis of Tractor and Plow Operating Factors," Major O. B. Zimmerman; "The Operating Speeds of Agricultural Implements," Percival White, Jr.; "Notes on Power Farming," R. W. Lohman.

Production session: "Routing and Accounting in Production," A. G. Drefs; "Training and Selection of Personnel for Efficient Production," Magnus W. Alexander; "The Workman, an Element in Production," A. F. Knobloch.

Engine Production Minneapolis Topic

MINNEAPOLIS, May 8—"Engine Design, from the Standpoint of Production," was the title of a paper presented to the S. A. E., Minneapolis section, this week, by C. W. Pendock, president and chief engineer of the Le Roi Engine Co. This meeting being marked by the election of officers for the forthcoming year; the officers elected were: A. W. Scarratt, chairman; R. S. Kinkea, vice-chairman; C. T. Stevens, secretary, and J. S. Clapper, treasurer.

JOHN W. HYATT DIES

NEW YORK, May 11—John Wesley Hyatt, inventor of the Hyatt roller bearing, died suddenly yesterday of heart disease at his home, Windermere Terrace, Short Hills, N. J. He was 83 years old. He was born at Starkey, N. Y., and received only a common school education, followed by a year at Eddytown Seminary. He went to Illinois as a youth and devoted all his time to invention.

Next to the roller bearing his most widely known invention was the material called celluloid. His brother, the late I. Smith Hyatt, shared in the discovery of the process for its manufacture. Mr. Hyatt's other patents covered a wide range and showed the extraordinary scope of his talent. He retired from active business years ago.

THEODORE C. FEDDERS DIES

Theodore C. Fedders, president of Fedders Mfg. Co., died at his residence in Buffalo Sunday May 2, at the age of 67 years.

Mr. Fedders was one of the pioneer makers of automotive radiators, having established the company which bears his name 20 years ago, originally as Fedders Sheet Metal Works.

For the past six years Mr. Fedders had devoted only a small part of his time to business, leaving it largely in charge of his four sons, Lou F., John M., Charles W., and Theodore C. Fedders, Jr., who now survive him.

PORTAGE OFFICIAL DIES

BARBERTON, O., May 8—News has been received here of the death at Raleigh, N. C., of C. R. Hatcher, general Southern representative of the Portage Tire & Rubber Co. His death was due to injuries he suffered when he slipped on the steps of a Raleigh hotel. Hatcher, who was 33 years old, was born in Atlanta. He had been in the Portage organization for three years.

Calendar

May 17-22 — Ship-by-Truck — Good Roads Week — May 17-22

SHOWS

Oct. 6-16—New York. Electrical Show. Grand Central Palace. George F. Parker, Manager.

Dec. 10-18—New York. Motor Boat Show. Grand Central Palace.

FOREIGN SHOWS

May 15-June 13 — Cars, Parts and Accessories. Antwerp.

June 21-27—Sunsvall, Sweden. Automobile Exhibition. Norrland Fair.

June 26-July 25 — Commercial vehicles, tractors, camions and engines. Antwerp.

July 9-20—London, England. International Aircraft Exhibition. Olympia. The Society of British Aircraft Constructors.

Aug. 7-Sept. 15 — Motorcycles, sidecars, etc. Antwerp.

October—London. Commercial Vehicle Show, Olympia.

November—London. Passenger Car Show, Olympia.

CONTESTS

May 17-27—Boise Truck Run, Salt Lake City to Boise. Intermountain Automotive Dealers Association.

May 31 — Indianapolis, Ind. Speedway.

May 31—Brockport, N. Y. Dirt track.

June 12—Uniontown, Pa. Speedway.

June 14—Omaha, Neb. Truck Reliability Run.

June 17—Portland, Ore. Dirt track.

June 17-18—Chicago, Inter-Club Run, Chicago Automobile Club.

June 19—Ogdensburg, N. Y. Dirt track.

July 4—Tacoma, Wash. Speedway.

July 4—Hanford, Cal. Dirt track.

July 4—Spokane, Wash. Dirt track.

July 5—Batavia, N. Y. Dirt track.

July 17 — Warren, Pa. Dirt track.

July 24—Watertown, N. Y. Dirt track.

July 31—Fulton, N. Y. Dirt track.

Aug. 7—Erie, Pa. Dirt track.

Aug. 14—Buffalo, N. Y. Dirt track.

Aug. 20-21—Middletown, N. Y. Dirt track.

Aug. 21—Johnstown City, Pa. Dirt track.

Aug. 21—Elgin, Ill. Road race, Chicago Automobile Club.

Aug. 28—Canandaigua, N. Y. Dirt track.

Aug. 27-8—Flemington, N. J. Dirt track.

August, 1920—Paris, France. Grand Prix Race. Sporting Commission Automobile Club of France.

Sept. 1—Glidden Tour—N. Y. to San Francisco.

Sept. 5 — Targa Florio Race, Sicily.

Sept. 6—Hornell, N. Y. Dirt track.

Sept. 6—Cincinnati, O. Speedway.

Sept. 6—Uniontown, Pa. Speedway.

Sept. 17-18—Syracuse, N. Y. Dirt track.

Sept. 25—Allentown, Pa. Dirt track.

Oct. 1-2—Trenton, N. J. Dirt track.

Oct. 8-9—Danbury, Conn. Dirt track.

CONVENTIONS

May 20-30—Atlantic City. Third American Aeronautic Congress, Aero Club of America.

May 24-26—Indianapolis, Service Managers' Convention. National Automobile Chamber Commerce, Service Division.

June 7-10 — Indianapolis, Ind. Annual Convention of the Associated Advertising Clubs.

June 7-11 — Del Monte, Cal. Automotive Equipment Association, Directors' Meeting, 7-8; General Sessions 10-11.

June 22-25—Asbury Park, N. J. Annual meeting American Society for Testing Materials.

S. A. E. MEETINGS

June 21-25 — Ottawa Beach, Mich. Summer Conference.

Manufacturers Combine in Ship-by-Truck Move

MILWAUKEE, May 10—The first organized effort by manufacturers in Wisconsin to take advantage of the possibilities of the motor truck for freight transportation, due to the breakdown of railroad service everywhere, has been taken by the Wisconsin Manufacturers' Association. George F. Kull, executive secretary, has addressed all members with a request if they wish to join with other members throughout Wisconsin in carrying out a ship-by-truck system reaching as far as New England. Under the auspices of the association, a factory at Delavan, Wis., received a 5-ton load of freight from New England during the past week, and it returned to its base with a load of freight from a factory in Madison, Wis. The replies of members have been very encouraging and it is believed there will be no difficulty in the way of creating an elaborate truck transportation system before the beginning of summer.

OGREN DIRECTORS MEET

MILWAUKEE, May 10—The Ogren Motor Car Co., which moved from Chicago to Milwaukee about a year ago, thus becoming the first passenger car factory to be established within the city noted for its automotive parts and truck manufacturers, became a Milwaukee institution at the annual meeting of stockholders during the week. The Illinois corporation is succeeded by a Wisconsin corporation of same name, with an authorized capitalization of $500,000. Officers were elected as follows: President and general manager, Hugo W. Ogren; vice-president, Elmer Froelk; secretary and treasurer, Fred G. Smith; directors, Wallace M. Bell and P. C. Kolinski, counsel. The factory is located at 692-704 National Avenue and is now in quantity production of the Ogren Six, a standardized chassis designed by Ogren, formerly a widely known racing driver, who has been engaged in passenger car engineering for 15 years or longer.

Omaha Reliability Tour to Start June 14

OMAHA, May 8—June 14 has been set for the start of the First National Motor Truck Reliability Contest which is to be conducted under the auspices of the *Omaha Bee* and with the sanction of the A. A. A. and motor car dealers associations in the Middle West. Charles P. Root, manager of the contest, made the selection of the date and set May 22 as the last day on which entries can be made.

The tour will start from Omaha and all cars entered must be in the hands of the management for examination not later than June 5. An earlier date for the start was considered but was abandoned when attention of the management was called to the fact that the Republican National Convention would be held in Chicago on June 8 and at that time the papers would be full of political news to the exclusion of all else.

FRANKLIN PREPARES DIVIDEND

SYRACUSE, N. Y., May 13—A stock dividend of 250 per cent will be declared by the H. H. Franklin Mfg. Co. out of its proposed new issue of $13,000,000 in common stock. An undivided surplus of approximately $1,000,000 will remain after the stock dividend.

Many Foreign Planes for British Air Show

LONDON, April 21 (*Special Correspondence*)—While some of the leading organs of the daily press are discussing the threatened collapse of the laboriously built-up private British enterprise in aircraft building and passenger service, preparations are well advanced for the Sixth International Aero Show to be held from July 9 to 20 at Olympia, London.

Exhibits will be allowed to be seen in motion by electric power but not by a spirit fuel. Already there is reported to be a promising entry representative of the American, French and Italian aircraft industry. A feature of the show will be trial and demonstration flights for purchasers' benefit. The Austin and a few other British motor makers have been listing private aircraft machines for some time, an advertised feature being that they offer an alternative to the road automobile, occupying no more space, and costing less for their relative mileage.

BAN TARGA FLORIO RACE

PARIS, April 17 (*Special Correspondence*)—In all probability the Targa Florio race, fixed for the month of September, will not be held. The Italian Automobile Manufacturers Union, which comprises all the leading manufacturers, has decided not to allow any of its members to participate in the race this year. This decision has been arrived at owing to the necessity of devoting all energies toward increased production. The Targa Florio race, which is held over a mountainous course on the island of Sicily, is for stock cars only.